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TEACHING NEUROMUSCULAR RELAXATION.

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THIS STUDY ATTEMPTED TO FIND OUT WHETHER (1) THE METHODS FOR ATTAINING NEUROMUSCULAR RELAXATION THAT HAVE PROVED FRUITFUL IN THE ONE-TO-ONE RELATIONSHIP OF THE CLINIC CAN BE SUCCESSFULLY ADAPTED TO THE TEACHER-CLASS RELATIONSHIP OF THE CLASSROOM AND GYMNASIUM, AND (2) NEUROMUSCULAR RELAXATION CAN BE TAUGHT SUCCESSFULLY BY AN APPROPRIATELY TRAINED PERSON WHO POSSESSES NO SPECIAL PERSONALITY TRAITS AND IS WITHOUT THE BENEFIT OF THE PHYSICIAN'S "STATUS HALO." BASED ON THE PROGRESSIVE RELAXATION METHOD OF E. JACOBSON, A 15-LESSON OUTLINE WAS DESIGNED FOR CLASSROOM INSTRUCTION USING TECHNIQUES TO REDUCE THE ACTIVITY OF THE NERVOUS AND MUSCULAR SYSTEMS. IN ADDITION, A TEACHER-TRAINING COURSE WAS DESIGNED ON THE THEORY, PRACTICE, AND TEACHING OF NEUROMUSCULAR RELAXATION. PERSONS WHO SUCCESSFULLY COMPLETED THE LATTER COURSE INSTRUCTED EXPERIMENTAL CLASSES OF COLLEGE STUDENTS AND OTHER GROUPS COMPOSED OF SUBJECTS WHO LEARNED RELAXATION THROUGH COURSES OFFERED IN LOCAL CHURCHES OR AT THE YMCA. ALL EXPERIMENTAL AND CONTROL SUBJECTS WERE GIVEN A BATTERY OF TESTS. RESULTS SHOWED THAT MOST ADULTS CAN BE TAUGHT THE SKILL OF RELAXATION IN 15 INSTRUCTION SESSIONS DURING A PERIOD OF 8 WEEKS. (JM)

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TEACHING NEUROMUSCULAR RELAXATION

Cooperative Research Project No. 1529

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PREFACE

A Tribute to William James

The problem for which the research here reported has found a solution is neither new nor newly identified. William James in his Talks to Teachers, 1899 (New York, Henry Holt and Co., 1939, p. 74,5) said the following:

> "We have lately had a number of accomplished Hindoo visitors at Cambridge, who talked freely of life and philosophy. More than one of them has confided to me that the sight of our faces, all contracted as they are with the habitual American over-intensity and anxiety of expression, and our ungraceful and distorted attitudes when sitting, made on him a very painful impression. 'I do not see,' said one, 'how it is possible for you to live as you do, without a single minute in your day deliberately given to tranquility and meditation. It is an invariable part of our Hindoo life to retire for at least half an hour daily into silence, to relax our muscles, govern our breathing, and meditate on eternal things. Every Hindoo child is trained to this from a very early age.' The good fruits of such a discipline were obvious in the physical repose and lack of tension, and the wonderful smoothness and calmness of facial expression, and imperturbability of these Orientals. I felt that my countrymen were depriving themselves of an essential grace of character. How many American children ever hear it said by parent or teacher, that they should relax their unused muscles, and as far as possible, when sitting, sit quite still? Not one in a thousand, not one in five thousand! Yet, from its reflex influence on the inner mental states, this ceaseless over-tension, over-motion, and over-expression are working us grievous national harm."

Because in the present research we have been able to show that any intelligent teacher can learn to teach others to "relax their unused muscles" with significant, measureable results, it is our opinion that William James who has given us inspiration to be teachers would look with favor on our work. We, therefore, make bold to dedicate to American Education as a tribute to his leadership, this our labor of the past two years.

AHS and JEN

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INTRODUCTION

Neuromuscular relaxation means reducing the activity of the nervous and muscular systems. In this sense one does not relax on the golf course. There one finds diversion. The benefits that come from diverting the mind from the problems and frustrations of the daily task by concentrating on golf are real but must never be confused with the more profound and farreaching effects on both physical and mental health that derive from mastery of the skill of relaxing one's muscles at will.

A great relief comes from closing the eyes against a bright light or from the stopping of a loud and persistent noise. Such relief is easily identified and well understood. Many people, however, do not know that a tense muscle sends nerve impulses into the brain and cord very much in the same way and with the same consequences as does an eye that is strongly stimulated by a bright light or an ear that is subject to a loud noise. Each feeds impulses into the waking or alerting centers of the reticular formation and consequently has similar potential for keeping the entire central nervous system in a state of alert. Thus neuromuscular relaxation may be said to be a "closing of the eyelids" in muscles.

But neuromuscular relaxation reaches much more deeply into the very nature of the mental process. It provides, in fact, a very simple and most dramatic demonstration and explanation of the often cited "unity of body and mind". To one who has learned to relax his musculature this phrase is not merely a smooth sounding cliche. It is for him a proven reality because he can at will stop the "internal talking" or singing to himself which often occurs after hearing an advertising jingle on radio. He can in fact stop all thought processes i.e. completely "blank his mind". He does this by relaxing the muscles of tongue and other voice organs and the muscles that move the eyeballs. Also, by relaxing all muscles except those that are essential for the task in hand, he can eliminate distracting thoughts and therefore more readily concentrate on what he needs to do. Thus, when reading, his mind is less likely to be distracted if he relaxes all muscles except those needed to sit comfortably, to hold the book, and to move the eyes across the page.

These extremely subjective experiences of persons who have mastered the art of relaxation are supported by textbook neurology and special laboratory tests. Merely thinking of moving an arm results in a slight contraction of the muscles that move the arm. This slight contraction is readily detected by amplifying the electric currents generated in the muscles that would move the arm. Similarly, the mere thinking of a word produces detectable electric potentials in the muscles of the tongue. Such slight contractions produce sufficient muscle tensions to stimulate the sense endings everywhere present in muscles. This results in the production of nerve impulses that are carried to the central nervous system where they become associated with the thinking that produced the tongue tension. In this way muscle tensions acting on muscle spindles and other muscle receptors become the conditional stimuli for neural activity of thought even as light from the printed page or sound waves of the spoken word acting on the retina and cochlea respectively, become the stimuli that are associated with the neural mechanisms of thought.

Because thought processes are initiated and sustained by serial activation of neural paths involving in large measure memory traces of words heard or spoken and of images recorded by the eyes, it is to be expected that nerve impulses from the musculature used in speaking and in moving the eyes will become connected with the thought processes evoked by what is spoken or seen and, in fact, become a part of them. No wonder, then, that relaxing these muscles will do much to stop thinking. The fact that such muscle tensions do not usually rise to the threshhold of consciousness in no way argues for their non-existence or non-importance. It does, however, help to explain why they have in large measure been overlooked as potential threats to man's health. We have had antiglare and antinoise campaigns with not always measureable value to man. To them should be added an antitension campaign. Because glare and noise both produce muscular tensions and because such tensions are reflexively self perpetuating, the antitension campaign may prove to be the most important.

The hopes and fears, joys and sorrows, successes and frustrations of man are physiologically speaking, neuromuscular tensions expressed in varying degrees of contraction of the musculature that moves the skeleton, pumps the blood, modifies blood pressure, digests food, creates "goose flesh", spits, chews, swallows, breathes, talks, smiles, scowls, shivers, and eliminates. The proper regulation of these tensions spells success or failure and health or sickness.

THE PROBLEM

Men and women in business, industry, and the professions in fact in all occupations of today's intensified living pace are more than ever subject to unnecessary neuromuscular tensions.

What we have long called "Wall Street Stomach" and the Germans have recently labeled "Managers Krankheit" are products of these tensions. In large measure they account for today's alarming incidence of insomnia, nervousness, high blood pressure, ulcers, colitis, certain heart conditions, and many serious mental conditions that plague or even destroy man in what should be the most productive years of life. In 1953 the late Professor Otto Graf of Dortmund, Germany published graphs comparing the death rates of men in highly responsible positions with those of the ordinary German male. Because of their germaness to the subject of this research, Professor Graf's charts are here reproduced as Figures 1 and 2 with legends translated.

There is today substantial evidence from a number of clinical centers that psychosomatic disorders responsible for many illnesses and premature deaths are relieved and even cured by a course of instruction in neuromuscular relaxation. This being established, it follows logically that such instruction if widely disseminated in the population would play an important role also in preventing such conditions. The focus of the study here reported was to determine if such a program of dissemination is feasible.

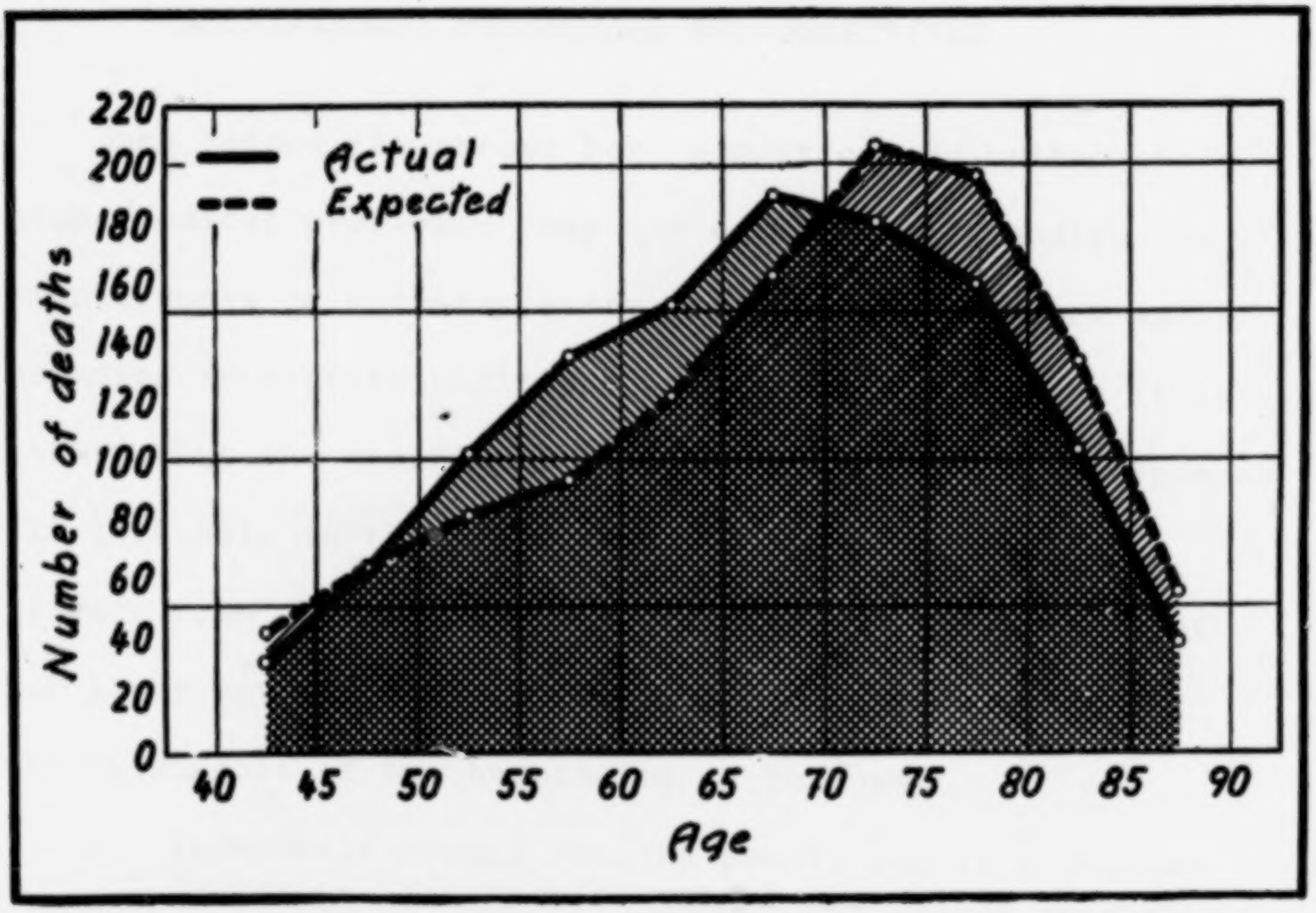


Fig. 1. Frequency distribution by age at time of death of 1152 German males in important positions of management (1947-'52) compared with expected frequency based on 200,000 deaths of average male population (1952) in Germany. After Otto GRAF in Die Krankheit der Verantwortlichen-Manager Krankheit (see text for reference).

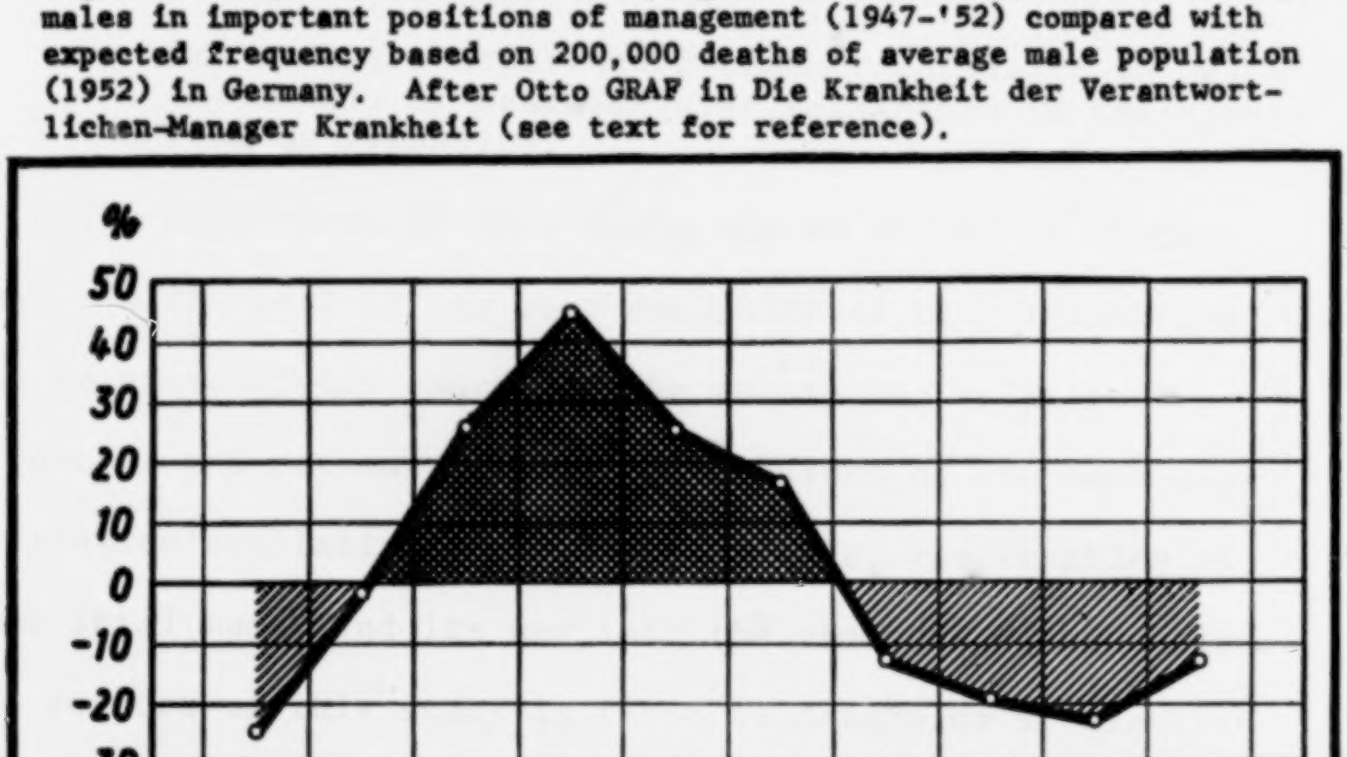


Fig. 2. Frequency of 1152 deaths of leaders in management positions expressed in percent above or below the expected number in each age group. (Source as for Fig. 1.)

ASSUMPTIONS, HYPOTHESES AND OBJECTIVES

Long before the stress born conditions described above become medical problems, they are concerns that modify the effectiveness of ordinary every day living; and since man's responses to stress conditions are learned responses, it is assumed that the modification or unlearning of such responses fall logically in the realm of education. Encouraged by evidence from a number of sporadic efforts, the authors of this study set out to see if they could amass a body of data in support of two hypotheses as follows:

1. Apparently normal healthy people can in a regular classroom situation be taught the skills of neuromuscular relaxation.
2. The ordinary experienced teacher can learn to teach the skills of neuromuscular relaxation in the classroom or gymnasium.

The objectives of this study can be stated in another way. In the past it has been demonstrated that relaxation can be successfully taught in the one-to-one relationship of doctor and patient. To make the values of neuromuscular relaxation available to the larger public, the teaching of this skill must find its way into the channels of education. The purpose of this study is first to determine if significant and measurable change in neuromuscular tensions can be shown to result from participation in classes designed to teach this skill and second to determine if the ordinary teacher without benefit of medical training or the "physician's halo" can learn to teach this skill to others.

To establish the tenets of these hypotheses and fulfill the objectives of the study it is necessary to determine by objective methods the amount of neuromuscular tension, blood pressure, etc. in subjects before and after a period of class instruction and to compare any observed differences with comparable data secured from groups of subjects tested at similar intervals but without intervening instruction. Such observations must be made on several groups of subjects that have been taught by a variety of ordinary teachers who have themselves been taught to teach neuromuscular relaxation. Because neuromuscular relaxation is so intimately related to entirely subjective and personal experiences, reports covering such experiences were also sought.

These steps have been successfully completed and the findings, subjected to appropriate statistical procedures, are here reported.

RELATED RESEARCH

The literature dealing with neuromuscular relaxation is extensive and varied. Several authors have each presented a method for relieving states of chronic muscular hypertension. As these methods are compared, it becomes evident that each is designed to serve essentially the same purpose and that the differences that do exist are primarily in the area of methodology. An outstanding feature of the method of "Progressive Relaxation" as proposed by Jacobson (13, 14, 15, 24, 25), is its emphasis on complete elimination of suggestion. In contrast, the method of "Autogenic Training" as proposed by Schultz and Luthe (33) lies at the opposite extreme and employs primarily autosuggestion. In fact, all of the methods that have been proposed can be placed on a continuum with pure hypnosis at one extreme and with its exact opposite, the complete absence of suggestion, at the other. It is recognized that some may argue that no instruction is completely devoid of the element of suggestion but in "Progressive Relaxation" Jacobson has made every effort to reduce this to a minimum. Since the present investigation is confined to a study of neuromuscular relaxation using the method of "Progressive Relaxation", we will limit ourselves by referring to the methods of Rathbone (31,32) and Swiegard (34,35) as illustrative of those that lie somewhere between the two extremes.

In the several reports of Jacobson cited above, he describes the method of "Progressive Relaxation". Briefly, it involves two steps: (1) the subject learns to be sensitive to residual tensions in skeletal muscle, and (2) he learns to release them. The process, which is eminently devoid of suggestion, is very much like the learning of any motor skill. The subject is first taught to be sensitive to residual tensions in the large muscles of the body. As he progresses, even such small muscles as those of the eyes and tongue are included. Once the subject has become aware of the presence of residual tension, he learns to reduce it through practice.

A major difficulty encountered in the study of neuromuscular relaxation has been the securing of a reliable apparatus for its measurement. In several reports, Jacobson (18,20,21,22) has described an integrating electromyograph which combines a very high sensitivity with a very low level of internal noise (0.1 microvolt R.M.S.). With this apparatus, he detected action potentials even in muscles giving every outward indication of being in a state of complete rest. Several others (Haugen, Dixon, and Dickel - 9, DeVries - 4, and Whatmore-37 and 39) have reported similar results with equipment patterned after that first described by Jacobson.

In contrast with these findings, Basmajian (2), Hoefer (11), Hoefer and Putnam (10), Basmajian and Latif (3) deny that action potentials always accompany tonus. For example, Basmajian (1957) states:

> "In thousands of electromyograms on normal human muslces, there has been complete and almost instantaneous relaxation when the subject has been ordered to relax.....Tone is a function of the nervous system controlling muscle, but also it is a function of the natural elasticity of the muscular and fibrous tissue. The normal "feel" of the muscle is determined by its normal tissue turgor and its immediate reflex response to palpation. Keep your hands off a resting normal muscle and it shows no more neuromuscular activity than one with its nerve cut."

For the present study it is essential to resolve this conflict for were the position of Basmajian correct, it would seem that an attempt was being made to measure something that does not exist. Even though all would be in agreement that there are no action potentials present in resting muscle, it must be recognized that it is rare for skeletal muscle ever to be completely at rest. Basmajian, however, gives the impression that upon command, most normal subjects can relax any muscle completely and instantaneously. We, however, in agreement with the reports of Whatmore (37), and Jacobson (26), have found that although well-trained subjects are able in a few minutes to relax muscles of the leg and sometimes of the arm to a point where all action potentials disappear, muscles of the forehead, jaw, and tongue are always more difficult to relax. We have never observed "almost instantaneous relaxation when the subject has been ordered to relax," as reported by Basmajian (2).

With equipment of sufficient sensitivity, action potentials are detectable in muscle that gives every other indication of being in a state of complete rest. The conflict, therefore, does not stem from a misunderstanding of the nature of resting muscle but rather from the measurement of seemingly resting muscle with equipment of insufficient sensitivity. This situation is somewhat analogous to the common experience of walking from a brightly illumined room into darkness. At first, unable to see a single object, one might erroneously conclude that no light is present. With increasing sensitivity of the retina to lower intensity of light, one is able to see quite well. Similarly, with sufficiently sensitive equipment, it is possible to detect action potentials in muscle, where less sensitive apparatus as that employed by Basmajian would register none.

A number of workers who have used neuromuscular relaxation with their patients in the one-to-one relationships of the clinic have implied that it would be a desirable skill for healthy persons to acquire through group instruction in the classroom. Thus, whereas Jacobson (25) indicates that a medical background is essential for the instruction of patients, he proposes that other qualified persons from the fields of psychology, physiology, and physical education must be trained if neuromuscular relaxation is to be taught to the masses as he believes it should. Similarly, in speaking of mass training in neuromuscular relaxation, Haugen, Dixon, and Dickel (9) state:

> "A specific measure could be applied in an attempt to prevent anxiety neuroses.....teaching the principles of relaxation to essentially healthy, normal youngsters would be within the scope of a well-trained physical education teacher."

There are many examples of the use of neuromuscular relaxation in the treatment of such stress related conditions. Some investigators have even postulated that anxiety neuroses cannot exist apart from chronic muscular hypertension and may even be caused by it. For example, Haugen, Dixon, and Dickel (9) who use the method of "Progressive Relaxation" report case studies of patients with anxiety or depression states in which neuromuscular relaxation played an important role in the eventual cure. In speaking of the adverse effects of chronic muscular hypertension, they state:

> "A persistent bombardment of excessively strong stimuli from chronic bracing of all striated musculature would result in overactivity of the arousal area, and culminate in the generation of apprehension, fear, and similar phenomena in the cortex."

Still further evidence of the value of relaxation as a preventive measure can be found in the reports of Whatmore (37, 38,39), where he reports that depressed patients have an unusually high residual motor activity and speculates that:

> "Although we often think of motor activity in mental illness as being secondary to psychic processes, the reverse possibility is a real one....Neurophysiologic considerations make it reasonable to assume that hyperponesis (high residual tension) may play some role in the production of depression."

Whatmore also reports diminution of depression states in proportion to the degree of skill acquired in neuromuscular relaxation. In another study (38) he finds that patients who are prone to recurrent depression maintain hyperponesis during periods of apparent recovery. He even suggests that the hyperponetic state may predispose to recurrence of depression.

Wolpe (40,41,42,43) views neurotic anxiety as a conditional response. In working with patients, he has successfully used neuromuscular relaxation to inhibit neurotic responses. To him, the basis of psychotherapy is the principle of reciprocal inhibition; he suggests the following proposition:

> "If a response inhibitory to anxiety can be made to occur in the presence of anxiety-evoking stimuli so that it is accompanied by a complete or partial suppression of the anxiety response, the bond between these stimuli and the anxiety response will be weakened."

After a careful assessment of the needs of the patient, a systematic desensitization is begun. The treatment begins by presenting to the imagination of the patient the weakest possible anxiety-evoking stimulus and suppressing the consequent reaction using neuromuscular relaxation as the inhibiting response. Stronger and stronger stimuli are presented in a like manner until there is complete desensitiaztion and even the strongest stimulus fails to evoke a response.

Haugen (8) refers to excessive muscular hypertenstion and states that no neurosis can be developed without it. Other examples of the use of neuromuscular relaxation in the treatment of stress related conditions can be found in the works of Holmes and Wolf (12), Kretchmer (20,29), Garmany (5), and Barlow (1).

For the most part, studies utilizing the method of "Progressive Relaxation" have dealt with the teaching of individual patients in the clinical situation. There are, however, two exceptions: (1) Zeiter and Lufkin (44) worked with a group of eleven physical therapy students at the Cleveland Clinic Foundation, and (2) Neufeld (30) reports the work done at U. S. Navy Air Schools during World War II. In the first study, the authors present an eight-lesson outline including lecture material and directions for teaching neuromuscular relaxation. The method of evaluation is subjective in terms of teacher and student observations. The second study reports the results of teaching neuromuscular relaxation to 3,238 aviation cadets in flight training. In this case, evaluation was on the basis of several factors such as the personal values reported by cadets, quieter sleep habits, better performances on swimming tests, and fewer minor personal injuries. Neither of these studies employed equipment capable of measuring results objectively.

Between 1939 and 1955 Jacobson published a series of studies on essential hypertension and coronary disease. In one study (16), he reported the usual drop in blood pressure associated with a change in position from standing to lying but also found a second further drop in those subjects who were able to decrease the residual tension in skeletal muscles to very low levels. This was not observed in subjects unable to relax. He concludes that the second drop was caused by reduction of tension in skeletal muscles and not attributable to the position of the subject.

In another study, Jacobson (17) noted that a slight muscular contraction such as clenching the fist for a short period of time causes a measurable rise in blood pressure. He concludes that blood pressure varies with the magnitude of contraction in skeletal muscles. In another study (23) he states:

> "Examination of individual blood pressure curves on the whole supports the view that chronic high blood pressure (in the absence of disease) can commonly result, in part at least, from excessive efforts in daily life and that the cultivation of a more relaxed state can tend in the opposite direction."

From direct observations on the excitability of the cat hypothalamus before and after injection of curare-like drugs, Gellhorn (6) concludes that proprioceptive stimuli arising in tense muscles profoundly affect the excitability of this region of the brain stem. It is in the stimulating actions of hypothalamic centers on the cortex and on general sympathetic discharges that he sees how a reduction of incoming proprioceptive impulses results in lessend cortical discharge, sleep, and general reduction of sympathetic tone. This would also account for a decrease in blood pressure.

Recently the ancient practice of Zen has come under scientific scrutiny. This practice, involving highly intricate and strictly defined rituals, requires years of practice. Its prescribed body positions and exacting mental discipline seem to force the mind into states that are similar to those achieved in extreme neuromuscular relaxation when the individual is able to "blank" the mind without sleeping. Koike and Yamoaka (27) report that the practice of Zen leads to several physiologic changes. In a study of Zen priests, breathing rates were lowered from an average rate of 15-18 breaths per minute to the low level of 2-3 very deep breaths per minute. As measured by the galvanic skin response, sweating stopped entirely. Oxygen consumption was lowered as much as thirty percent while the heart rate was slightly elevated. In the same study, it was reported that in EEG's, theta waves were noted soon after the beginning of Zen.

One would not expect to find theta waves present in EEG's during neuromuscular relaxation. Since theta waves often have been mistaken (36) for slow alpha waves, perhaps this is the case here. Decreased oxygen consumption and slower respiration accompanying neuromuscular relaxation have also been noted by Jacobson (15). The observation of a raised heart rate with Zen is in contrast to the report of Jacobson (19) where, in a study of the relationship between heart rate and chronic muscular hypertension, he found that both heart rate and heart voltage rose and fell in step with changes in muscle tension.

Such observations of the value of neuromuscular relaxation in the treatment of many disorders common to our times, leads one to the assumption that the teaching of neuromuscular relaxation to large groups as a preventive measure would be a worthwhile undertaking.

PROCEDURE

Based on the method of "Progressive Relaxation" as described by Jacobson (13, 14, 15), a fifteen-lesson outline was designed for classroom instruction of all subjects. In addition, a teacher-training course entitled "Theory, Practice, and Teaching of Neuromuscular Relaxation" was designed. Persons successfully completing the requirements of the latter course were certified as instructors of relaxation by George Williams College and the Foundation for Scientific Relaxation. Outlines of both courses are included in the appendix to this report. To date, the instructors' course has been offered five times and 101 persons have been certified.

Two distinct experimental groups were used in this study. The first group, hereafter called the "Student" group was composed of George Williams College students of both sexes who, for one reason or another, elected the one-quarter hour course in neuromuscular relaxation that has been offered quarterly since the beginning of this study. Classes ranging in size from three to twenty students met in two eighty-minute periods per week for instruction and testing. In every case, classes were taught by certified instructors. All students were required to be tested before instruction was begun and again at the completion of the fifteen lessons.

The second group, hereafter called the "General Population", was composed of subjects who availed themselves of the opportunity to learn relaxation through courses offered in local churches or at the Y.M.C.A. These classes were composed of persons of both sexes and ranging in age from twenty one to seventy two. Those who participated in the Y.M.C.A. program did so on a paying basis. In all cases, these classes were taught by certified instructors. Arrangements were made for all persons to be tested in the laboratory at George Williams College but since some lived at great distances, many who came for the first test failed to return for the second test. Consequently, the number of subjects in this group whose data were usable for this study, was greatly reduced.

Control subjects for the Student group were students of George Williams College who were willing to cooperate and could schedule the time necessary for testing. The control for the general population was composed of professional workers, clerical workers, and laborers who were willing to be tested and who could spare the time.

All subjects, both experimental and control, were given a battery of tests measuring the following parameters:

systolic and diastolic arterial blood pressure; heart rate; respiratory rate; and resting action potentials of forehead, arm, and leg muscles. With the exception of blood pressure, all measurements were recorded on a Sanborn six-channel polygraph model 156-356. Systolic and diastolic arterial pressure was taken by the usual clinical method with sphygmomanometer and stethoscope. Heart rate was recorded with a Sanborn electrocardiograph model 350-3200. Respiratory rate was recorded with a transducer-type pneumograph coupled with a Sanborn carrier preamplifier model 350-1100A. Electromyograms were recorded with three specially designed highgain preamplifiers that are responsive to action potentials of extremely low intensity. These amplifiers differ from the usual electromyograph in that they combine high sensitivity with a low level of internal noise (0.1 - 0.3 microvolt R.M.S.) These amplifiers were patterned after those reported earlier by Jacobson (19). The action potentials were integrated and recorded once per minute as a vertical line on the polygraph tracing. The height of this line is then compared with a similar calibration line gained from a standard input signal of one microvolt from a General Radio audio frequency microvolter model 546C. Standard ECG electrodes of appropriate sizes and Sanborn Redux paste were used to pick up the electrical activity from resting muscles and the heart.

Experimental and control groups were subjected to the same testing procedure. All subjects were measured once before instruction was begun and once again at the completion of the fifteen lessons. In addition, some of the subjects in the student group and their controls were tested every two weeks during the training program. Each subject was scheduled for a first test according to his own convenience. The second test was administered at about the same time of day and by the same technician. All tests were given in the same laboratory under standard conditions. The temperature of the room could not be completely controlled but the subject was always made comfortable. Another group was tested nine times within three days to determine possible practice effects of repeated testing.

In preparation for testing, each subject was given written instructions to refrain from the use of coffee, tea, alcohol, cola, tobacco, and medication for a period of at least eight hours prior to the test. Upon reporting to the laboratory the subject was asked to empty his bladder, eat a piece of candy, and then assume the supine position on a cot in the testing room. The technician then connected the necessary apparatus and checked the operation of each piece of equipment. With a well-trained technician, this preparatory procedure consumed about ten minutes.

As soon as all was in readiness, systolic and diastolic blood pressures were measured and recorded. The ECG and pneumogram were recorded simultaneously for one minute at a paper speed of five millimeters per second. Immediately thereafter, tracings of integrated action potentials from the forehead, arm, and leg were recorded simultaneously in separate channels for a period of twenty minutes at a paper speed of 15 millimeters per minute. Tracings of heart and respiratory rates were again recorded. Also systolic and diastolic blood pressure were again read and recorded as before. It is these second readings of heart rate, respiratory rate, and blood pressure that are used in the analyses here reported. Pictures of equipment and subjects during the testing procedure are included in the appendix.

All information taken from the polygraph tracings was recorded on 5x8 index cards and subsequently analysed by the methods of analysis of variance and covariance.

ANALYSES OF THE DATA AND FINDINGS

A. Can Neuromuscular Relaxation Be Taught in the Classroom?

1. Muscle Tension

In order to determine whether repeated testing would itself result in significant score improvement due to a practice effect, nineteen untrained subjects were measured nine times within a three-day period. Each subject was measured in the morning, in the afternoon, and in the evening and this schedule was repeated three times. The results of these tests, summarized in Figure 3, show a gradual increase in tension during each test day. Analyses of variance of these data, disclosed that some of the between-test differences were statistically significant, but since none of these differences occurred between tests given at the same time of day, it was concluded that the observed increases of tension between morning and later tests are indicative of a probable diurnal cycle and are clearly not an effect of repeated testing. On the basis of these data, it was decided that all tests designed to reflect changes due to instruction must be given at the same time of day.

The phenomenon of neuromuscular tension is associated with the expression of many factors including the inmost feelings of the individual. As such, it may be expected to be

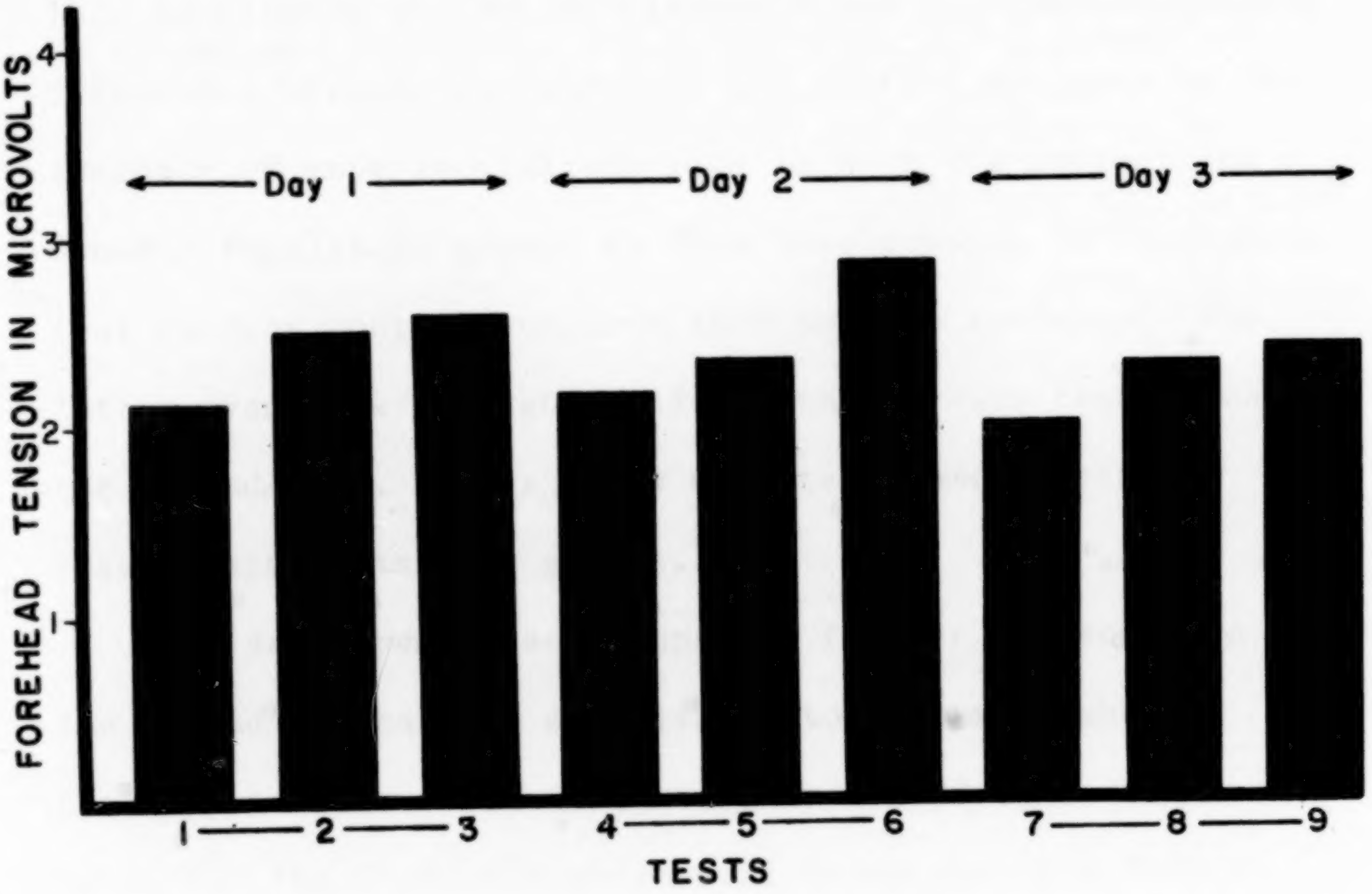


FIGURE 3 Average Forehead Tensions of Nineteen Untrained Subjects Measured Nine Times Within Three Days to Show Absence of Practice Effect. Step-wise Progression indicates Probable Diurnal Cycle.

extremely labile and variable from day to day, hour to hour, and even moment to moment. Only from a large body of data can one expect to find enough stability to draw sound conclusions and even then must one expect to find individuals who are atypical of the group of which they are a part.

This is clearly evident in Figures 4 and 5. The outstanding difference between experimental and control subjects is the tendency of experimental subjects in both the Student and General Population groups to show less tension on the second test whereas control subjects show no such tendency. The latter even show a slight tendency to increase tension on the second test. As is to be expected, some atypical results appear in both groups.

The data from these groups was further subjected to the method of analysis of variance to determine whether the drop in mean forehead tension from 2.27 to 1.36 microvolts for the Student experimental group and from 3.23 to 2.38 microvolts for the General Population experimental group is statistically significant. A summary of these analyses is presented in Table I. The F ratios of 54.67 for the Student group and 21.41 for the General Population group are both significant well beyond the .001 level. No F ratio was computed for the Student control group since it showed no mean difference. The rise of .27 microvolts observed in the General Population control group fails to reach the .05 level of significance.

Since it was not feasible to equate experimental and control subjects at the start of the experiment, the data

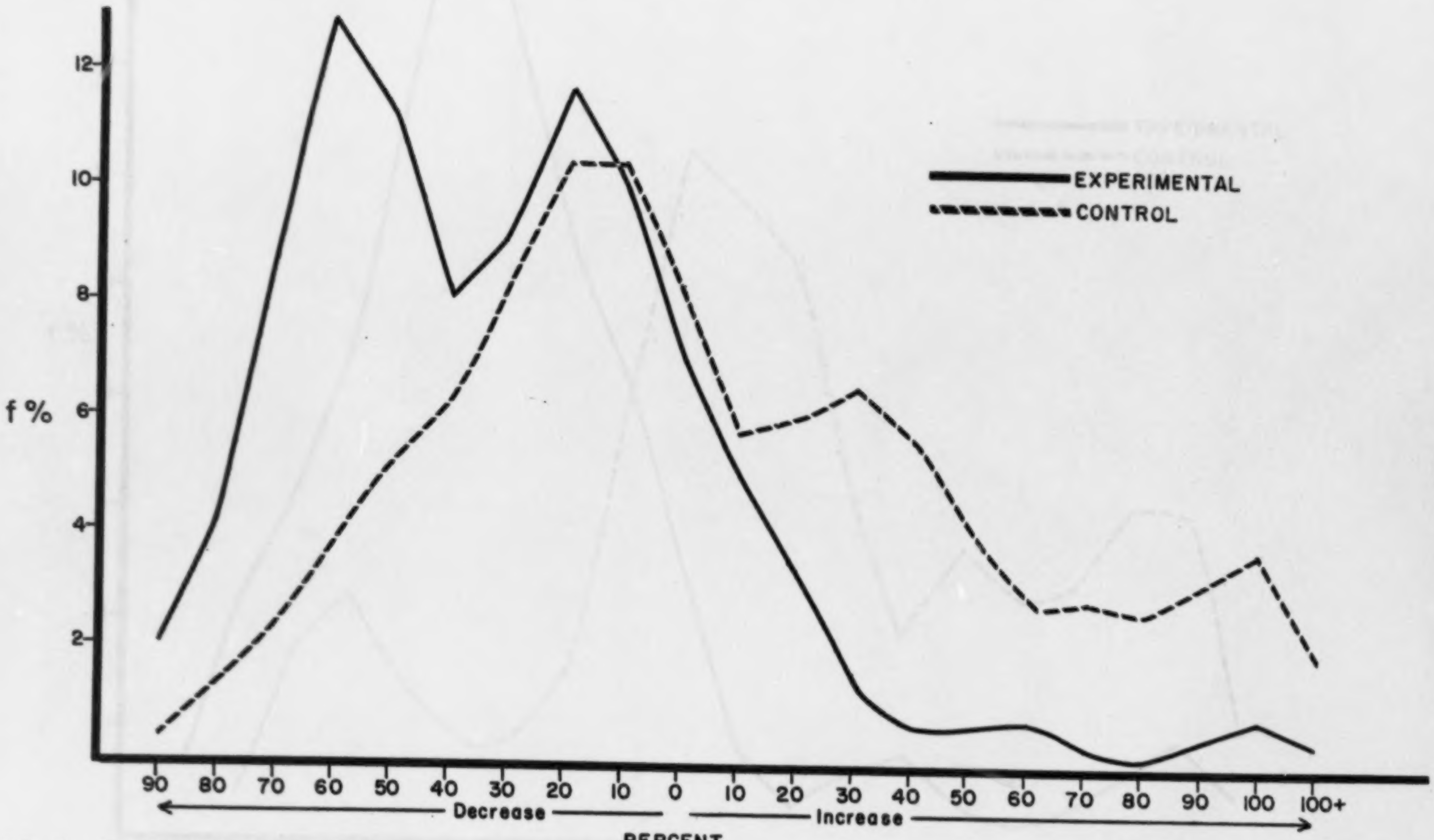


FIGURE 4. Smoothed Frequency Polygons Representing the Distribution of Changes in Forehead Tension Expressed as Percent Deviation from Initial Tension. The experimental group was given eight weeks of instruction in neuromuscular relaxation between tests.

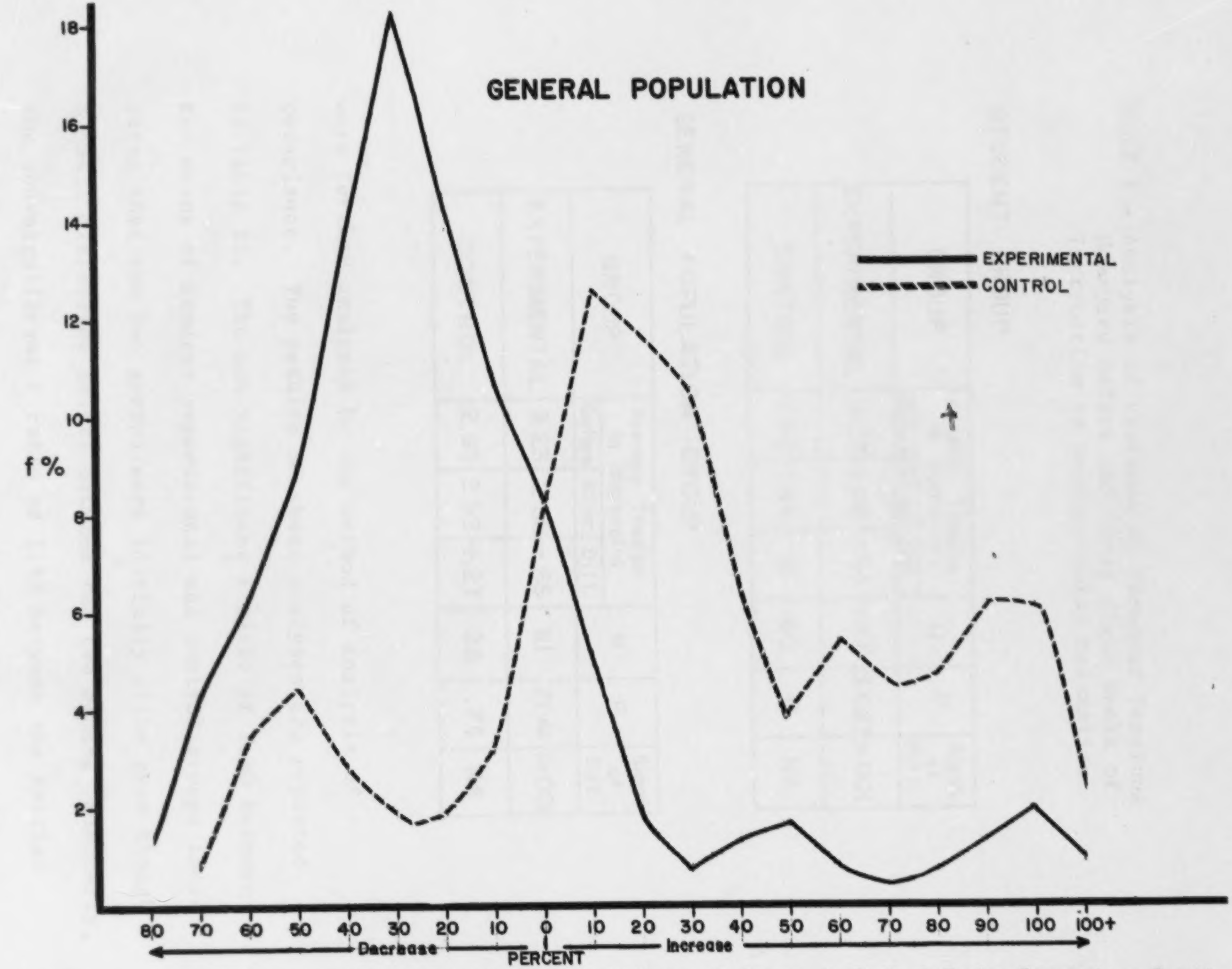


FIGURE 5 Smoothed Frequency Polygons Representing the Distribution of Changes in Forehead Tension Expressed as Percent Deviation from Initial Tension. The experimental group was given eight weeks of instruction in neuromuscular relaxation between tests.

TABLE I - Analysis of Variance of Forehead Tensions Measured Before and After Eight Weeks of Instruction in Neuromuscular Relaxation.

STUDENT GROUP

GROUP	Average Tension in Microvolts			N	F	Signif. of Diff.
	Before	After	Diff.			
EXPERIMENTAL	2.27	1.36	-.91	120	54.67	>.001
CONTROL	1.94	1.94	0	80	0	NS

GENERAL POPULATION GROUP

GROUP	Average Tension In Microvolts			N	F	Signif of Diff.
	Before	After	Diff.			
EXPERIMENTAL	3 23	2 38	-.85	81	21.41	>.001
CONTROL	2.65	2.92	+.27	28	.73	NS

were further analysed by the method of analysis of covariance. The results of these analyses are reported in Table II. The non-significant F ratio of 1.80 between the means of Student experimental and control groups indicates that the two groups were initially alike even though a small difference exists between the two means. Similarly, the non-significant F ratio of 1.45 between the initial means of the General Population experimental and control

TABLE II - Analysis of Covariance of Before and After Means of Forehead Tension. Experimental Groups Are Compared to Control Groups with After Means Adjusted for Initial Differences.

STUDENT GROUP

MEANS	Average Tension in Microvolts			F	Signif. of Diff.
	Exper.	Control	Diff.		
BEFORE	2.27	1.94	+.33	1.80	NS
AFTER (adjusted)	1.30	2.00	−.70	33.98	>.001

GENERAL POPULATION GROUP

MEANS	Average Tension in Microvolts			F	Signif. of Diff.
	Exper.	Control	Diff.		
BEFORE	3.23	2.65	+.58	1.45	NS
AFTER (adjusted)	2.26	3.04	−.78	11.74	>.001

groups indicates that these two groups were also initially alike. When the final test scores of both the Student and the General Population groups are adjusted for the initial differences by the method of analysis of covariance, the resulting F ratios become significant well beyond the .001 level. It is evident from these data that experimental and control groups did not differ initially. After eight weeks of instruction in neuromuscular relaxation, however, a highly significant difference was found to exist.

Arm muscle tensions were recorded on some experimental and control subjects of both the Student and General Population groups. These findings are presented in Table III and reveal that tensions in arm muscles of

TABLE III - Analysis of Variance of Arm Tensions Measured Before and After Eight Weeks of Instruction in Neuromuscular Relaxation.

STUDENT GROUP

GROUP	Average Tension in Microvolts			N	F	Level of Signif.
	Before	After	Diff.			
EXPERIMENTAL	.57	.45	-.12	56	4.50	>.05
CONTROL	.50	.38	-.12	76	3.36	NS

GENERAL POPULATION GROUP

GROUP	Average Tension in Microvolts			N	F	Level of Signif.
	Before	After	Diff.			
EXPERIMENTAL	.87	.60	.27	61	19.73	>.001
CONTROL	.39	.36	.03	27	0	NS

experimental subjects also show significant tension decreases whereas differences in control subjects fail to reach the .05 level of significance.

Although measurements of tension in leg muscles were taken, they are omitted from this report because most subjects were able, even on initial tests, to approximate the basic noise level of the amplifier (0.1-0.3 microvolts R.M.S.) so closely that subsequent reductions were unreliable even with the very sensitive equipment in our laboratory.

2. Arterial Blood Pressure

From systolic and diastolic blood pressures of subjects in both the Student and General Population groups, it was observed that even before instruction almost all subjects in the Student Group exhibited blood pressures well within the normal range. Changes were neither expected nor found following instruction in relaxation.

Such normalcy was, however, not characteristic of the General Population group. Table IV presents the analysis of variance of blood pressure data from 57 experimental and 28 control subjects in this group. The F ratio of 2.14 for the mean difference of -7 mm. Hg in systolic pressure of all experimental subjects failed to reach the .05 level of significance. Thirty five of the subjects in this group were, however, already well within the range of normal systolic pressures and could not be expected to show a decrease. The group was therefore sub-divided arbitrarily into three categories: (1) those 130 mm. and over; (2) those under 130 mm. but over 110 mm.; and (3) those 110 mm. and

TABLE IV - Analysis of Blood Pressure Changes in General Population Group. The experimental group received instruction in neuromuscular relaxation between tests. All pressures are recorded in mm Hg.

SYSTOLIC

	SUBGROUP	N	FIRST TEST	SECOND TEST	DIFF.	F-RATIO	SIGNIF. of DIFF'S.
Experimental	ALL	57	132	125	-7	2.14	NS
	130 and over	22	144	136	-8	4.97	> .05
	110 and under	6	101	105	+4	1.78	NS
Control	ALL	28	121	123	+2	.98	NS
	130 and over	8	140	142	+2	.08	NS
	110 and under	5	101	106	+5	2.71	NS

DIASTOLIC

	SUBGROUP	N	FIRST TEST	SECOND TEST	DIFF.	F-RATIO	SIGNIF. of DIFF'S.
Experimental	ALL	57	83	78	-5	8.49	> .01
	80 and over	29	92	83	-9	19.83	> .001
	79 and under	28	73	73	0	0	NS
Control	ALL	28	78	80	+2	.90	NS
	80 and over	11	88	86	-2	.71	NS
	79 and under	17	72	75	+3	6.53	.05

under. The F ratio of the 8 mm. reduction for subjects exhibiting initial pressure of 130 mm. and above is significant well beyond the .05 level. The other categories show no significant differences. All of the corresponding control groups show slight but non-significant rises in means of systolic pressure on the final test.

Diastolic pressures for the same group were subjected to a similar analysis (see Table IV). The resulting F ratio of 8.49 for a 5 mm. drop in mean diastolic pressure for the entire experimental group is significant well beyond the .01 level. The corresponding control group shows a slight, non-significant rise. When the experimental group is sub-divided as indicated in Table IV, the subjects with initial pressures of 80 and over show a decrease of 9 mm. which is significant well beyond the .001 level. No such decrease is shown when the control group is subjected to similar treatment. No explanation is offered for the significant increase of 3 mm. observed in the control group composed of individuals with an initial pressure below 79 mm.

3. Heart Rate and Respiratory Rate

From Table V it is evident that no changes in heart rate or respiratory rate occurred in the experimental or control subjects of either the Student or General Population group.

TABLE V - Heart and Respiratory Rates of Various groups Before and After Eight Weeks of Instruction in Neuromuscular Relaxation.

GROUP	Heart Rate			Respiratory Rate		
	N	Before	After	N	Before	After
STUDENT						
Experimental	53	65.7	65.9	35	14.7	14.5
Control	107	65.4	62.9	94	15.6	16.2
GENERAL POPULATION						
Experimental	53	79.3	78.9	44	15.0	15.4
Control	24	67.1	67.0	21	15.4	16.3

These findings are somewhat at variance with those of others. Jacobson (15) reports having observed reductions in both heart and respiratory rates related to relaxing ability. Koike and Kiyoski (27) on the other hand observed moderate increases in heart rates and marked reductions in respiratory rates in highly trained priests of the Zen persuasion when in deep practice of their habitual ritual. Their moderate increases in heart rate may be due to the sitting position assumed in the ritual whereas Jacobson's patients and our subjects are tested in the reclining posture. From observations on two exceptional subjects not included in this report, we are inclined to believe that much longer training in relaxation might result in significant changes in respiratory rate. When fully relaxed these subjects, who have trained for many years, regularly show respiratory rates of three or four per minute as do the priests of Zen.

4. Personal and Subjective Experiences

Many of the most significant changes that should follow the learning of neuromuscular relaxation are by their very nature, entirely personal and even purely subjective experiences. Granted that such experiences lack objectivity and are impossible to validate, they cannot for these reasons be said to lack reality.

Fully realizing the limitations of our procedure we nevertheless on two occasions sent questionnaires to persons who had received instruction in neuromuscular relaxation. The first of these (see appendix) sought free answers to 19 questions. It was sent to 212 persons in the spring of 1963 and was returned by 149 whose ages ranged from 19 to 67 years.

The salient findings were as follows:

1. Most persons sought instruction for personal, general use, and to become teachers of others. Approximately one fourth of the 149 indicated

that their motivation derived from a known specific personal problem.

2. 87 percent had continued some form of practice since completing the course of instruction.
3. 91 percent reported some definite benefit to have been derived from such instruction. Ten persons reported no benefit and three did not answer the question.
4. The specific benefits reported ranged widely from reduction of insomnia to improved performance in everyday work.
5. Of 134 persons who answered the question, 71 reported some benefit during athletic performance. 57 indicated this benefit had to do with better performance and staying powers during competition and seven felt it helped in recovery after exertion.
6. Of special interest were replies indicating that 101 persons had found one particular spot to be a "tension spot" in their bodies and 84 of these persons felt that this spot was still apparent.
7. 49 percent of 137 persons answering the question felt the need of further instruction in relaxation.

A second questionnaire was sent in January of 1964 to 225 persons who had received classroom instruction in relaxation. It was of the closed type and was designed to determine the frequency of certain specific benefits which had been mentioned in replies to the earlier questionnaire. (see appendix) At the time of writing this report 166 replies had been received with the following findings.

1. 66% report that sleep comes more quickly than before instruction. Of the 89 persons who reported approximately how long it took them to fall asleep 19 reported from seconds to four minutes; 27 said 5 minutes; 28, six to ten minutes; 10, eleven to fifteen minutes; and 5, sixteen minutes or longer.
2. 53% reported that they could "blank" their minds by relaxing. Forty eight persons answered the question concerning the length of such periods. Answers ranged from a few seconds to over 20 minutes with 19 reporting periods of less than 5 minutes and 29 periods of 5 minutes or longer.
3. 52% reported ability to stop "inner voices" or "singing to myself" at will.
4. 54% reported improvement in power of mental

concentration.

5. 27% indicated they were able to stop headaches.
6. 39% said they could reduce the sensation of pain.
7. 21% reported improved elimination.
8. 24% reported improved digestion.
9. 43% reported improvement of disposition.
10. 7% had observed no changes due to instruction in relaxation.

A large number of other benefits were reported. Many of these referred to the saving of energy, postponement of fatigue, and ability to secure "refreshment" quickly in the course of a strenuous day. Increased alertness and less fatigue from nerve-wracking or long auto trips and greater ease in facing up to challenging problems and people, were mentioned frequently. Loss of fear of the dentist, reduction or elimination of smoking, disappearance of chest tension and low-back pain, the elimination of facial ticks including an eye tick of 50 years standing, and painless childbirth without anaesthesia, were also mentioned. Many persons indicated that continued practice after completing the instruction period was necessary to assure continuation of beneficial effects.

The diaries that were submitted to instructors at weekly intervals were another source of information on students' personal and subjective experiences. Among the commoner observations not already mentioned were the following:

(1) Increasing awareness of previously unnoticed tensions while participating in everyday activities and while watching exciting programs on TV.
(2) Reduction of shoulder and neck pains while driving on long trips.
(3) Ability to maintain composure in presence of superiors and in job interviews.
(4) Alleviation of distress and elimination of pain associated with the menstrual cycle.

Generalization Regarding Teaching Neuromuscular Relaxation in the Classroom

The observations of significant changes in muscle tensions and blood pressures and the subjective reports of subjects whom we have instructed support the hypothesis that neuromuscular relaxation is a skill that can be successfully taught in the classroom.

B. Can Neuromuscular Relaxation Be Taught by Appropriately Trained Non-Medical Personnel?

In order to test the hypothesis that neuromuscular relaxation is a skill that can be taught by persons with adequate training, data were collected on subjects taught by a variety of certified instructors. Average before and after forehead tensions of individuals taught by ten different certified instructors are presented in Table VI. In each case, the group mean was lowered after an eight-week program of instruction in neuromuscular relaxation. Figures 6 and 7 present the progress of individual subjects in two classes taught by two different instructors.

TABLE VI - Forehead Tension Changes in Students Taught by Ten Different Instructors

INSTRUCTOR	Before	After	Diff.	N*
A	2.85	2.25	.60	49
B	3.88	2.38	.50	13
C	2.36	1.45	.91	79
D	2.63	1.63	1.00	13
E	2.15	1.36	.79	20
F	4.26	2.95	1.31	4
G	1.57	0.87	.70	3
H	4.48	2.26	2.22	2
I	6.87	4.15	2.72	4
J	2.67	0.99	1.68	5

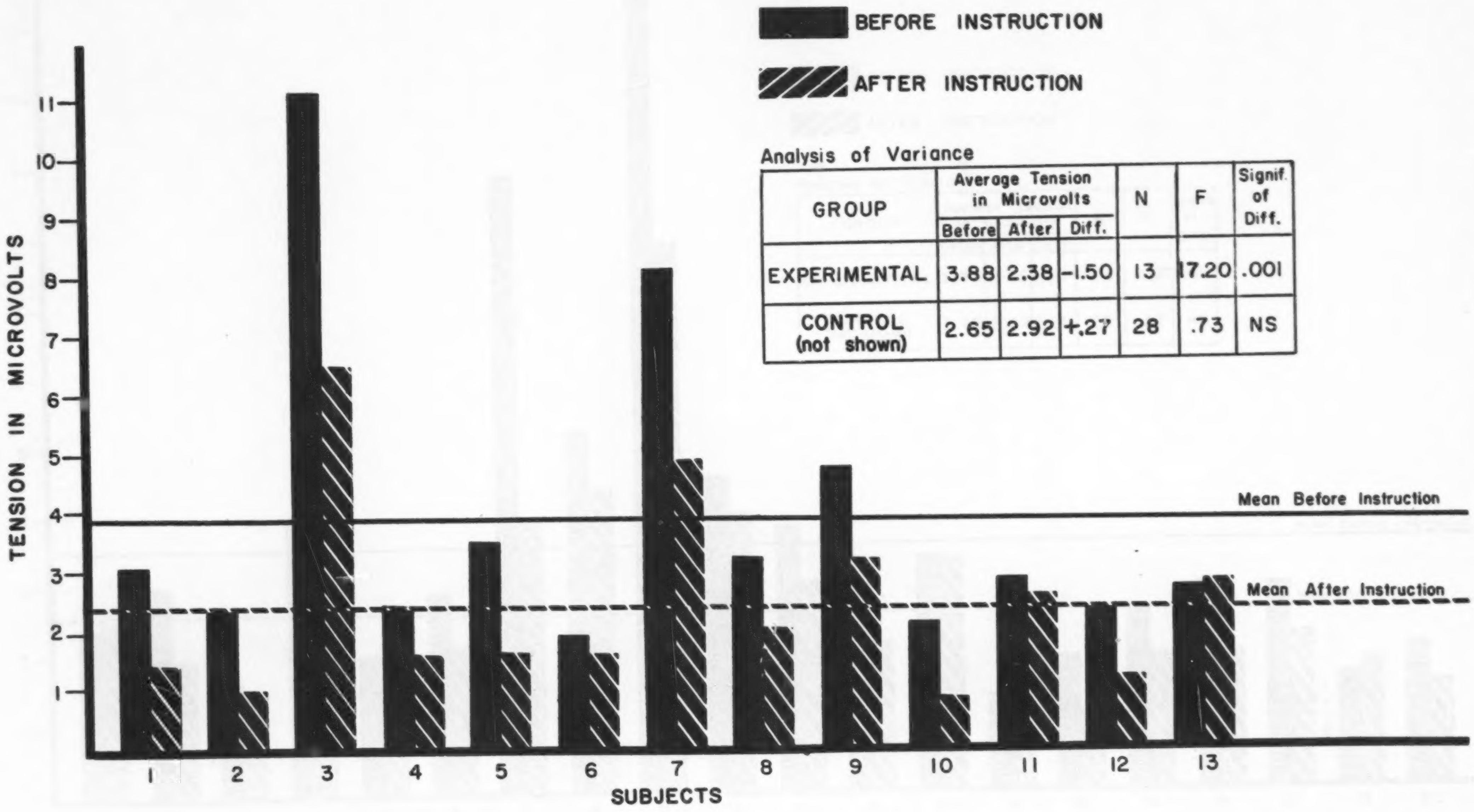
(*Includes only subjects on whom pre-and post-instruction tests were made and is unrelated to number or size of classes.)

Generalization Regarding Teaching of Neuromuscular Relaxation by Non-Medical Personnel

These data would suggest that neuromuscular relaxation can be taught successfully by well-trained instructors without benefit of the "status halo" of the physician.

C. How Long Does It Take to Learn to Relax?

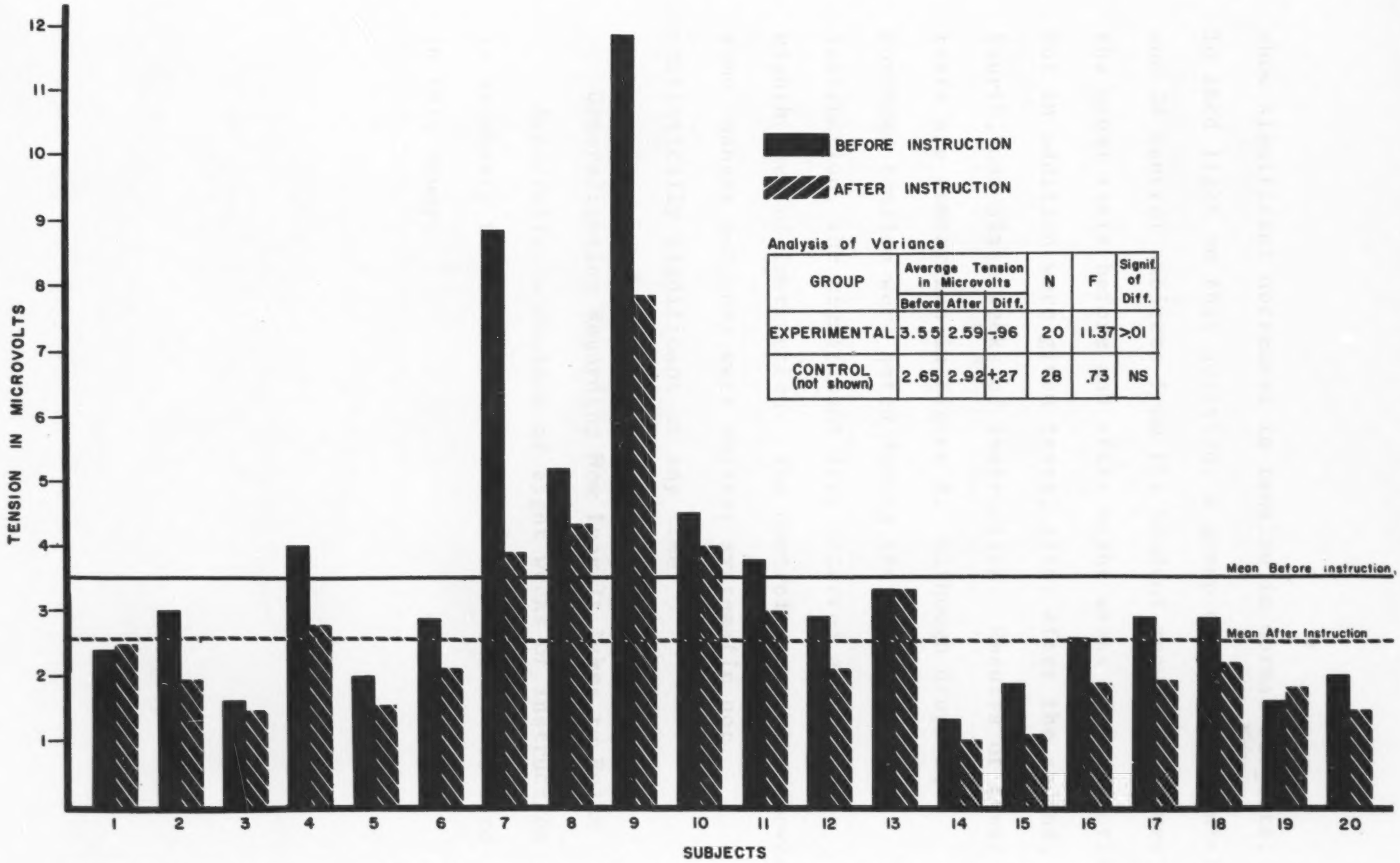
In several publications (15, 24, 25) Jacobson has expressed the necessity for a program of instruction to extend over many months. Since our subjects differ greatly from those generally encountered in clinical practice, the question arose concerning the length of time necessary to



Analysis of Variance

GROUP	Average Tension in Microvolts			N	F	Signif. of Diff.
	Before	After	Diff.			
EXPERIMENTAL	3.88	2.38	-1.50	13	17.20	.001
CONTROL (not shown)	2.65	2.92	+.27	28	.73	NS

FIGURE 6 Forehead Tensions in Thirteen Subjects of a Typical Church Group Measured Before and After Eight Weeks of Instruction in Neuromuscular Relaxation. (Instructor B)



Analysis of Variance

GROUP	Average Tension in Microvolts			N	F	Signif. of Diff.
	Before	After	Diff.			
EXPERIMENTAL	3.55	2.59	-.96	20	11.37	>.01
CONTROL (not shown)	2.65	2.92	+.27	28	.73	NS

FIGURE 7 Forehead Tensions in Twenty Subjects of a Typical Y.M.C.A. Group Measured Before and After Eight Weeks of Instruction in Neuromuscular Relaxation. (Instructor A)

show significant decreases in tension in normal subjects. To shed light on this question, a group of 31 experimental and 24 control subjects from the Student group were given the usual tests before and after eight weeks of instruction but in addition were given tests, also, after the second, fourth, and sixth weeks of instruction. Results of these tests are summarized in Figure 8. Although drops in forehead tension were noted during the first weeks of instruction, the significant drop occurred after the eighth week of instruction. The control group also showed some changes but they were neither systematic nor statistically significant at any time.

Generalization Regarding How Long It Takes to Relax

Apparently, a minimum of eight weeks of instruction is necessary for successful results with the method used in this study.

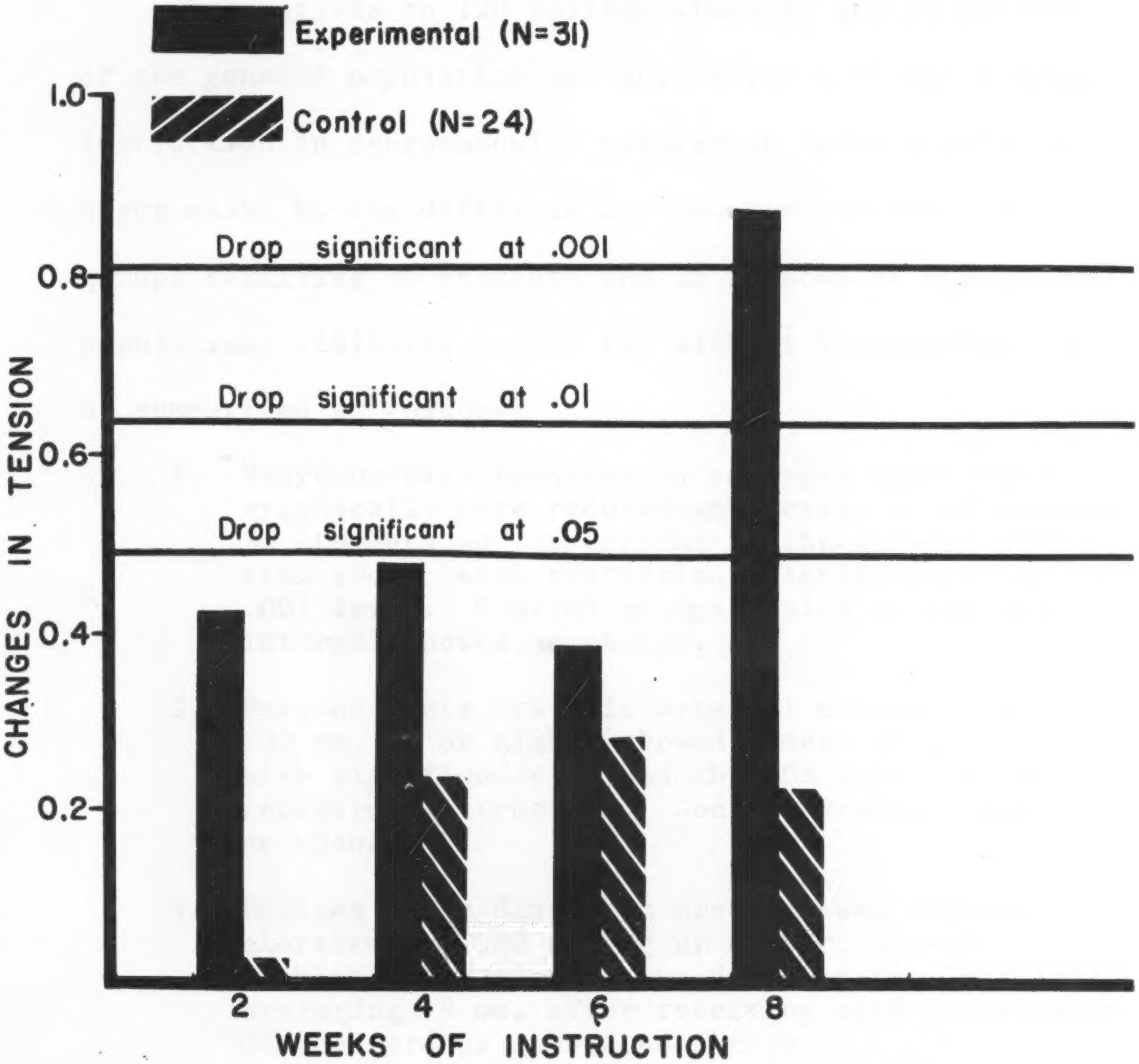


FIGURE 8. Changes in Tension Related to Weeks of Instruction. Column Height Shows Reduction of Tension Compared with Test Given Before Instruction.

SUMMARY OF FINDINGS

Observations on 120 college students and 81 persons of the general population who were given systematic group instruction in neuromuscular relaxation twice weekly for eight weeks by ten different instructors and four control groups totalling 80 students and 28 persons of the general population, similarly tested but without instruction, may be summarized as follows:

1. Neuromuscular tensions as recorded electromyographically were reduced an average of 40 percent in students and 26 percent in the general population group with statistical significances at the .001 level. Control groups tested at the same interval showed no change.

2. Persons whose systolic arterial pressure was 130 mm. Hg or higher showed a mean drop of 8 mm. with significance beyond the .05 level, after receiving instruction. Control groups showed no change.

3. Persons whose diastolic pressure was somewhat elevated i.e. 80 mm. Hg or higher, showed statistically significant drops at the .001 level averaging 9 mm. after receiving such instruction. Control groups showed no change.

4. No changes in resting heart or respiratory rates were observed to result from eight weeks of instruction in neuromuscular relaxation.

5. A great majority of subjects reported desirable changes in personal and purely subjective experiences such as ability to fall asleep more quickly, ability to stop unwanted mental activity to the point of "blanking the mind", reduction of

headaches and sensitivity to pain, reduced irritability and noticeably improved disposition.

6. **College students and the general public were successfully taught neuromuscular relaxation in class groupings of 3-30 persons.**

7. **Ordinary teachers and other intelligent persons were taught to teach neuromuscular relaxation to others with satisfactory, measurable results.**

8. **With the method of instruction followed in this study it is apparent that a period of eight weeks is necessary to secure significant reductions of muscle tension in the average person. Whether a drastic change in method of teaching could shorten this period seems unlikely but is not ruled out.**

CONCLUSIONS AND IMPLICATIONS

There is increasing evidence that the ability to relax one's muscles at will is a desirable and effective skill for combatting the inroads of today's highly accelerated living pace on man's physical and mental health.

The skill of neuromuscular relaxation appears also to favor more efficient use of the mind and to improve the power of concentration.

Most adults can be taught the skill of relaxation in fifteen instruction sessions during a period of eight weeks. Because the present study did not include persons below the age of seventeen, careful observations with appropriately modified methods of instruction should be undertaken to determine if similar results may be expected in younger persons.

In the light of our findings and those of others it appears that the addition of instruction in neuromuscular relaxation to college and upper high school curricula would be a valuable adjunct to teaching for health and the more efficient use of the mind.

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NEUROMUSCULAR RELAXATION
A
COURSE OF FIFTEEN LESSONS

Adapted by

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(With permission of Dr. Edmund Jacobson)

Introduction

There are many approaches to the theory and practice of relaxation. Some have associated the practice with highly intricate and strictly defined rituals involving special exercises for the body and mind. Some are based on more occult practices involving hypnosis, self hypnosis, or various levels of autosuggestion. The approach used in this series of lessons is that of the learning process. It is based on the following simple assumptions and principles:

1. Neuromuscular tensions are habitual behavior patterns. Some may be genetically based but most of them are acquired in planned or fortuitous learning situations.
2. Habitual muscle tensions give rise to proprioceptive nerve impulses which usually do not register as sensations in consciousness and therefore go unnoticed.
3. Man can learn to increase his sensitivity or awareness to the point where he will identify these tensions consciously even as a blind man can increase his sensitivity to identify the characters on the Braille page.

4. Upon becoming aware of the tension sensation a person can learn to increase or decrease the initiating muscular activity in any or all muscles, at will.

5. Any reduction of impulses entering the central nervous system including those arising in tense muscles will have a general "quieting" effect with a variety of readily envisaged beneficial results.

The lessons here presented are in no sense to be construed as a "system" for teaching relaxation. They are merely one time-tested method based on the above principles. For anyone to memorize or otherwise slavishly, follow these directions would be to become a disciple rather than a student of relaxation. Learning and teaching demands the student attitude, not blind discipleship.

Neither the teacher nor the student is asked to use these lessons in "cook-book" fashion. It is rather hoped that both teacher and student will see the principles outlined above embodied in the method of this outline. It is our belief that the principles here enunciated are sound and worthy of most serious attention. The method of instruction here suggested is, however, just as certainly subject to change and improvement.

As for the mastery of any skill, the skill of relaxing demands much practice. The student is urged to practice daily and to record both his practice periods and his experiences on specially prepared diary sheets. Some persons will find it most desirable to practice several times a day, ten or fifteen minutes at a time. Others may prefer a single, longer period. The diaries will be collected and examined by the instructor once a week.

Lesson 1

Time (approx.) **COMMENTS**: In a course of 15 lessons in 8 weeks, we plan to teach habits that should improve your health, efficiency, and happiness throughout life. To ensure maximum results it is essential to have your intelligent and faithful cooperation.

15 min. For most lessons there will be short text assignments from one book, YOU MUST RELAX by Edmund Jacobson, and from related mimeographed material. Assignments should be done in advance of the lesson period.

Each class period will consist mainly of actual practice in relaxing the muscles, taking one group at a time. There will also be short lectures or discussions of theory and practice. Text assignments will be reviewed in a midterm quiz and a final examination. Weekly bring to class a record of home practice on the diary pages provided for this purpose.

Promptness is absolutely necessary. Absences because of illness or other legitimate reason can in some instances be made up by appointment with the instructor.

Relaxation should be practiced outside of class for an hour every day. Some people will prefer to do this in two half hour periods. In addition, the student should often relax as far as he can while active, even if only for a moment. For example he can easily let the arms go limp while walking or the legs while sitting. Such practice may actually save time by lessening fatigue and increasing alertness, working efficiency, and speed.

ASSIGNMENT: Briefly glance over the textbook and all reference materal.

PRACTICE for left and right wrist extensors and flexors.

5 min. Lie down (or sit in a chair), let eyes close gradually, rest comfortably and quietly.

10 min. Bend left and right hands slowly back at the wrist, hold in position, then quickly relax. Where is tension felt? Repeat and go on relaxing.

15 min. With forearm on its side, thumb uppermost, bend the left and right hand in at the wrist, hold, quickly relax. Where is tension felt? Repeat, then continue to relax.

15 min. Bend hands in at the wrist with half as much force. Relax slowly. Repeat, bending just enough to feel it; relax quickly, and continue.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 2

Time (approx.) **COMMENTS**: In this course you should learn
to recognize excessive tension and avoid or reduce
15 min. it almost without thinking about it. Like the de-
velopment of other such habitual types of behavior,
this requires regular daily practice, as for
learning to swim or playing the piano. If an hour
at a time is too much, try several shorter periods.
The best time is midday, to refreash you for the
afternoon, but any time before the evening meal is
healpful. A perfectly quiet room is not necessary,
yet you should not be interrupted by a knock or
other disturbance. Do not watch the clock; use an
alarm or ask someone to call you at the end of the
practice period.

For today we shall review a desirable plan for home practice. We shall illustrate this in three typical periods allowing fifteen to twenty minutes for each.

During the first two of such a three period series the tension is repeated before you relax, but for every third period you omit preliminary tensions and relax from the start. This helps train you to relax at once from any degree of tension during the day, without wasting time in tensing exercises. The tensing exercises serve only to make you aware of the tension signal. With practice you should be able to detect even slight tensions in any part of your body without first accentuating them.

ASSIGNMENTS: Read YOU MUST RELAX: Preface; Chapter 1 Modern Living and Chapter 2 Tension.

PRACTICE for Muscle Groups as in Lesson 1, left and right wrist extensors and flexors.

5 min. Rest in relaxing position, gradually closing eyes.

15 min. Bend left and right hand slowly back at the wrist, hold, then quickly relax, noting the feeling of tension and relaxation. Repeat, bending half as far, and relax quickly, and continue to relax.

5 min. Rest in general relaxing position, as at the beginning of instruction.

15 min. With forearms on side, bend left and right hand in at the wrist, hold, and quickly relax. Repeat, bending half as far, relax slowly. Repeat with just enough effort to feel it, relax quickly, and continue.

5 min. Rest quietly as at beginning of period.

10 min. Without preliminary tension, relax both muscle groups that bend the hands and continue to relax.

5 min. Stop relaxing. Time for questions.

Lesson 3

Time (approx.)

15 min. **COMMENTS**: In this modern age, people in many parts of the world are living with appallingly high tensions. The so-called diseases of civilization, including many types of heart disorder, peptic ulcer, nervous breakdown and high blood pressure, are closely related to excessive muscular tension. Many people are far too tense. Everyone can think of illustrations of how modern life has increased the sources of tension. But tensions exist only in people.

Much of this unnecessary stress and strain can be eliminated by employing scientifically tested methods of relaxation. How and when did these methods originate? About fifty years ago, Dr. Edmund Jacobson began to search for the cause of the "nervous start". He found that when subjects heard a sudden, loud noise, they jerked more violently when they were holding themselves tense. When, however, they were asked to relax as much as possible, the jerk motion was less or did not occur at all. A few subjects learned to relax very well and hardly noticed the sudden noise.

Next, a painful shock was applied electrically through salt water in which the subject's fingers were dipped. At first the hand was snatched away, but during relaxation, movement was less. An extremely relaxed subject did not even feel the shock and the hand did not move. Other reflexes such as the knee-jerk produced by a tap on the patellar tendon also diminished as tension decreased.

X-ray films demonstrated that internal organs may become spastic when skeletal muscles are habitually tense. For example, the gullet may tighten and produce a choking sensation, or the colon may contract in painful cramps. These conditions were often greatly relieved by learning to relax. The x-ray also brought verification that involuntary internal spasms are reduced by lessening voluntary muscular tension.

Experiments on tension and relaxation are continuing to this day. Instruments that measure muscular tension electrically, disclose that the average person can learn to reduce his tensions from 25-40% in a course of instruction.

ASSIGNMENT: YOU MUST RELAX: Chapter 12, Scientific Relaxation and OUTLINE of Scientific Relaxation Parts 1, 2 & 3 inclusive.

PRACTICE for left elbow flexors and extensors.

5 min. Rest comfortably, letting eyes close gradually.

10 min. Bend arm slowly at elbow, quickly relax. Where is tension felt? Repeat tension and relax; continue to relax.

15 min. Bend arm again, half as far as before. Relax slowly. Repeat tension, bending only enough to feel it. Relax quickly and continue to relax.

10 min. Straighten arm at elbow, hold, quickly relax. Where is it felt? Repeat, relax quickly, and continue to relax.

15 min. Straighten arm again with half as much force. Relax slowly. Repeat tension just enough to feel it, relax quickly, continue to relax.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 4

Time (approx.)

15 min. **COMMENTS**: It is important to understand how scientifically based, learned neuromuscular relaxation differs from other attempts to induce relaxation that may be totally unrelated to what is taught in this course where (1) the learner is taught to manage his own muscles and finally becomes independent of the teacher. He can then relax anywhere, at any time, without help from other people. (2) he does not have to get rid of problems first, or leave his job, or try to find peace of mind; he simply reduces superfluous tension in tight muscles. (3) he can practically eliminate residual tension without going to sleep, a fact still not generally recognized. It is this final, extreme degree of relaxation that is so restful and refreshing for healthy persons and so effective in relieving patients with tension diseases.

Your ability to relax is not complete until you can go all the way. That is our goal.

Today you will learn slow, gradual tension and relaxation of both arms. This is a good way to learn to eliminate residual tension. It is also useful in other ways. It shows that you can be very quiet, without any visible movement and seemingly well relaxed, even though you are actually exceedingly tense. A third advantage is that tightening the whole arm is a good way to discover the feeling of tenseness which some learners have trouble locating in single muscle groups.

ASSIGNMENT: YOU MUST RELAX: Chapter 13, How to Relax Lying Down and OUTLINE Part 4, Beginners' Problems.

PRACTICE in slow progressive tension and relaxation of left arm, then both arms, without moving.

5 min. Rest in relaxing position, closing eyes gradually.

10 min. Slowly tense and relax all muscles in the left arm from finger tips to shoulder, carefully noting the difference in feeling. Repeat this entire procedure, then continue to relax.

15 min. Slowly tense half as much, slowly relax. Again, half of that, watching for tension also called the "control sensation". Finally, barely enough to feel it. Let it go, and continue to relax.

10 min. Slowly tense and relax all muscles in both arms, noting the control sensation. Repeat, then continue to relax.

15 min. Slowly tense and relax all muscles in both arms, but as you tense use only half as much effort as before; then half of that. Finally, just enough to feel it.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 5

Time (approx.)

15 min. **COMMENTS:** The first few lessons in relaxation are sometimes very trying. Some people, in attempting to let their muscles go, often become more tense, and therefore less comfortable. It is easier to put up with this difficulty if it is understood.

Both the lying and the sitting position used in practice are designed to make you comfortable and help you to learn as fast as you can. Your weight should be supported as evenly as possible. The strain of twisted or bent limbs avoided, and as far as possible, body sensations like touch reduced. The preparations make it easier to notice the very faint control sensation produced by muscular contraction.

In the lying position the student lies flat on his back, with legs straight and slightly apart at the knee and ankles. The arms are also straight and a little apart from the body, so as not to touch it. In sitting position the feet may rest flat on the soles or mainly on the heels, with soles tilted up. Do not cross either the ankles or knees. The back should rest against the back of the chair. Arms may lie on chair arms or in the lap. The head is erect or bowed, depending on specific instructions.

If you are uncomfortable, it probably means you are still tense. You should try to relax more, rather than shift to another position. Movements may merely increase your tension and discomfort. But don't try to hold yourself still since this, too, increases tension and can make you miserable. The best plan is to do whatever you can toward following instructions, put up with difficulties the best you can, and don't worry. Do not concentrate on relaxing, but now and then notice for just a moment whether the muscle group of the lesson is tense, and try to let it go a little more. During the day, remember to relax the same muscles whenever you aren't using them, even if only very briefly and slightly. The oftener you lower needless tension, the sooner it becomes a habit.

Lesson 5 (Cont.-3)

ASSIGNMENT: YOU MUST RELAX: Chapter 8, Tense Persons; Chapter 9, Overactive Nerves.

PRACTICE for left and right ankle flexors and left and right ankle extensors.

5 min.	Rest, gradually closing eyes.
10 min.	Bend or flex left and right foot slowly at ankle, hold, quickly relax. Where is this felt? Repeat. Relax and continue to let muscles go.
15 min.	Flex feet, half as far as before. Relax slowly. Repeat, with one-fourth original effort, and relax quickly. Tense just enough to feel it, relax, and continue to relax.
10 min.	Extend right and left foot at ankle by pulling heel up toward calf and toes down, hold, quickly relax. Where is this felt? Repeat tension. Relax quickly and continue to let muscles go.
15 min.	Extend half as far as before, relax slowly. Repeat with one-fourth original effort, relax quickly. Tense just enough to feel it, relax and continue to relax.
5 min.	Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 6

Time (approx.) 15 min.

COMMENTS: Neuromuscular relaxation has been presented to learners in two ways. These are (1) Progressive Relaxation, described in Dr. Jacobson's book with that title, and (2) Self Operations Control, first called Tension Control. These two methods are very similar in principle but differ slightly in terminology, methods of presentation, and emphasis. It is easy to understand both.

Progressive relaxation is the original form from which the second was derived. It is very thorough and especially useful when much rest is desired. Self operations control is particularly designed to help one notice and lower high muscular tensions during daily activities.

Progressive relaxation was so named for three reasons. First, training proceeds from one muscle group to another. Second, as lessons continue, muscles that are trained become progressively more relaxed. Third, even from the first lesson, relaxation tends to spread from the groups deliberately relaxed to those not yet trained. A thorough course may introduce only one muscle group per lesson. It may, in turn, include all the major groups in lying position, then review them all in sitting position while performing some activity, such as reading or writing.

In self operations control the student learns to think of operating his body as he does a motor car, avoiding unnecessary effort and too high speed. He can readily grasp the idea if he actually does drive a car, pilot a plane, or handle other machinery. He is constantly reminded that he must learn to regulate energy output with great skill, as well as to start and stop his efforts at will, and if necessary very quickly. In a typical course, more time may be spent seated than lying down, or with head erect rather than drooping, or with eyes open instead of closed. However, both methods teach practically complete as well as differential (see lesson 7) relaxation, and both emphasize that the pupil should not relax too much or at the wrong time for his best interests. The purpose of both methods is muscular control, which depends on identifying and regulating the control sensation of tenseness in muscles.

ASSIGNMENT: YOU MUST RELAX, Chapter 14, How to Relax While Active, and OUTLINE Part 5, Aids in Practice.

PRACTICE for left and right leg extensors and flexors of the knee.

5 min. Rest, gradually closing eyes.

10 min. Extend left and right lower leg, slowly straightening leg at knee, hold, quickly relax. Where is this felt? Repeat tension, relax quickly, and continue to let muscles go.

15 min. Extend leg as far as before, relax slowly. Repeat tension with one-fourth original effort, and relax quickly. Tense just enough to feel it, relax quickly, and continue to relax.

10 min. Bend or flex left and right leg at knee, sliding foot back; hold tensely, relax quickly. Replace foot to first position. Repeat tension, relax quickly, and continue to relax without moving foot again.

15 min. Tense half as much as before, relax slowly; one-fourth as much, then just enough to feel it, relaxing quickly without moving again; continue to relax.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 7

Time (approx.) **COMMENTS**: Complete relaxation though never fully attained is nevertheless easy to understand.

15 min. It means relaxing all muscles of the body as completely as possible. It is best done in the reclining posture and promotes the onset of sleep. It is also the goal when there is special need to reduce the effects of tension on stomach, heart, and other viscera.

Differential relaxation needs a bit more careful explanation. It is, in fact, the practice with universal application in the futherance of physical and mental health and the effective use of the body in every day activities as well as athletic performance. Simply stated it means, differentiating between muscles that are necessary for an activity and those that are not. To relax muscles that are not needed in the performance of a specific task is differential relaxation. It also means differentiating between strong and weak contractions of the needed muscles and relaxing them as much as possible. A good example in a relaxation class is sitting in a chair with all muscles limp except those that hold the head up.

Differential relaxation answers the objections' of some people who think they will be taught to relax too much or too often, when they should be keen and alert. Actually, letting go of the muscles not needed is not being lazy or incompetent, but rather the opposite. It reduces physical and mental fatigue and makes one more efficient, able to do more and better work. For example, while seated in a bus, one can let his arms and legs be rather limp, yet many riders cross the knees or ankles and keep moving hands or feet as a restless habit. Others scowl, clamp their jaws, or press the lips together. Some may appear quiet and well relaxed yet have a rigid neck or back, often a source of distressing aches and pains. Controlled differential relaxation is necessary in any muscular skill. Undue tension in an athlete handicaps him in competition. Appropriate differential relaxation is the mark of skill and grace in all body movement.

But do not expect perfect control at all times. You may be able to lower your tensions only a third

Lesson 7 (Cont.-3)

as much as theoretically possible, yet even this much can make a tremendous difference in daily life.

ASSIGNMENT: YOU MUST RELAX: Chapter 3, Tension and Heart Attacks; Chapter 4 Efforts and high Blood pressure.

PRACTICE for muscle groups that draw in addomen and those that arch back.

5 min. Rest, gradually closing eyes.

10 min. Pull in abdominal muscles slowly, hold, quickly relax, noting tense feeling. Repeat contraction, relax quickly, and continue to let go.

15 min. Pull in with half as much effort as before, relax slowly. Repeat with one-forth original effort, relax quickly, tense just enough to feel it, relax quickly, and continue to relax.

10 min. Arch back slowly, hold, quickly relax. Repeat, and continue to relax.

15 min. Arch with half the first effort, relax slowly. Repeat with one-fourth original effort, relax quickly. Now simply imagine arching back slowly to greatest extent, hold, then quickly relax and "go to zero", if you can.

5 min. Stop relaxing. How many noticed tension while imagining? Time for questions.

STUDENT'S CLASS NOTES

Lesson 8

Time (approx.) **COMMENTS**: Scientific relaxation of voluntary
muscles reduces overactivity not only in these
15 min. tissues but in the entire body, including internal
organs not under direct voluntary control. That
is why learning to relax may prevent serious illness as well as ordinary muscular fatigue.

Overactive voluntary muscles affect other parts of the body in several ways. (1) By demanding more food and oxygen and creating more waste products, tense muscles throw increased burden on other organs. This is probably not a much increased burden. (2) Tense muscles stimulate their contained sense endings. This results in a bombardment of the spinal cord and higher nerve centers with excessive nerve impulses. These impulses may activate nerve centers from which internal organs such as the heart, blood vessels, stomach and certain endocrine glands receive their nerve supplies. This may result in increased blood pressure and heart rate, interference with stomach, other digestive organs and the endocrine glands that produce so-called "stress hormones". It has been claimed that muscular tensions directly cause about 1/3 of present day illness and are contributing factors in the causation of another third.

Among the greatest enthusiasts for neuromuscular relaxation are men and women whose more serious tension disorders greatly improved or disappeared when they learned to relax. For healthy people, neuromuscular relaxation is a form of preventive medicine. In this sense instruction in neuromuscular relaxation may well become a most important phase of physical education.

ASSIGNMENT: YOU MUST RELAX: Chapter 5, Anxiety; Chapter 6, Anxiety and Ulcers; Chapter 7, Fears and Success.

PRACTICE for breathing muscles and those that pull shoulders backward, forward, and upward.

5 min. Rest, gradually closing eyes.

10 min. Take a deep breath, observe tenseness; hold, breath out naturally. Breathe with no special effort. Repeat deep breath, breathe out, continue to breathe easily.

5 min. Observe tenseness during regular breathing, then breathe easily without thinking about or even noticing that you are breathing.

5 min. Pull shoulders back slowly, noticing the control

Lesson 8 (Cont.-3)

	sensation; hold, then quickly relax. Repeat and continue relaxation.
10 min.	Repeat with half as much tension, relax slowly; repeat with one-fourth the first effort, relax quickly and continue relaxing.
10 min.	Draw left and right arms forward across chest, relax quickly. Repeat, relax slowly, go on relaxing.
10 min.	Shrug shoulders, relax quickly. Repeat, relax slowly, go on relaxing.
5 min.	Stop relaxing. Time for questons.

STUDENT'S CLASS NOTES

Lesson 9

Time (approx.)

15 min. **COMMENTS**: The present is often called the "age of anxiety". We generally blame our worries and fears on such things as low income, a difficult job, or the Cold War. Yet often when the main problem is solved, the worrier finds something else to worry about. If so, his chronic anxiety may be due to chronically overtense muscles.

This may be explained by the physiology of muscular tension. Whenever a muscle contracts, electrical activity is present, not only in the muscle but also in the nerves that carry messages in both directions between the muscle and the spinal cord and brain. Increased activity in muscles is paralleled by increased activity in the entire central nervous system including the centers of the emotions. In animals it has been demonstrated that when they are relaxed, nerve activity and the accompanying electrical activity are measurably reduced in both the cortex and the subcortical centers from which emotional activity arises.

You can remain tense long after the original cause of the tension has disappeared and you cannot even recall what it was. The muscular tension originally associated with the fear state may reawaken this feeling without recalling the incident in which it first became so associated. Muscle tension may thus bring on so-called "floating fears" or anxiety states to color a person's entire outlook. Apprehension may also become associated with various temporary events such as entrance exams and college tests. Anxiety may at times become concentrated in a phobia such as an undue fear of heights, storms, cats, open or enclosed spaces, or what not. Dozens of forms have been recognized and named. Normal, reasonable fears are useful even life-saving; but exaggerated ones may be destructive.

Whatever the cause of chronic fear, there is always an accompanying increase in muscle tension which helps to perpetuate the condition. When habitually tense muscles are successfully relaxed, worries often fade away. The victim is then better able to master the problems within his capability, and to live with those he cannot solve.

Lesson 9 (Cont.-3)

ASSIGNMENT: YOU MUST RELAX, Chapter 10, Tranquilizers; Chapter 11, Quieting Your Nerves.

PRACTICE for neck muscles that pull the head backward and forward, to left and right.

5 min. Rest, gradually closing eyes, with head drooping forward.

5 min. Raise head slowly; hold, quickly relax, letting it fall forward. Repeat, and continue to relax.

10 min. Repeat raising head but with half as much effort, and relax slowly. Imagine raising with strong, slow contraction and slow relaxation. Then let head fall forward and go to zero, as nearly as possible.

10 min. From erect position, bend head to the left while resisting the movement with your left hand, return to erect position. Repeat with half the effort, then just enough to feel it. Relax, forward.

20 min. Bend head right resisting the movement with your right hand, same routine as for left. Bend forward, resisting the movement with either hand, same routine.

5 min. Hold head erect with as little effort as possible, lightly poised. When the head is in this position it will fall or roll easily in any direction when moved slightly by the instructor.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 10

Time (approx.)

15 min. **Midterm quiz**, reviewing text material assigned to date: YOU MUST RELAX, Chapter 1 to 14, inclusive, and OUTLINE parts 1 to 5 inclusive.

The quiz consists of true-false, and multiple choice questions designed to cover both theory and practice of relaxation, as presented in class and in the assigned text readings.

ASSIGNMENT: YOU MUST RELAX, Chapter 16 Measuring Tension.

PRACTICE for facial muscles near the eyes, i.e., those that raise the eyebrows, those that frown and those that close eyelids.

5 min. Rest, gradually closing eyes.

5 min. Raise eyebrows slowly, hold a moment, relax quickly. Raise again, hold, relax very slowly. Continue to relax.

15 min. Lift eyebrows enough to feel tenseness in forehead with as little tension as possible; relax. Repeat and go to zero if you can.

5 min. Draw the eyebrows close together in a strong frown, quickly relax. Repeat frown, relax slowly, and go completely negative, if you can.

10 min. Frown just enough to feel it above the nose, relax quickly, repeat with even less tension, still trying to feel it; relax to zero.

Lesson 10 (Cont.-2)

15 min. Close lids tightly but slowly, observing control sensation all the way. Now simply imagine tensing slowly, and relax as slowly. Now imagine tensing more, more, hold lids tight, then gradually let go a little, a little more, still more, then all the way. Continue to relax.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 11

Time (approx.)

COMMENTS: Medical aids such as tranquilizers, pain killers, and sleeping pills have a place in

15 min. modern medicine; but relaxation can often accomplish the same results more naturally than drugs can.

There are several reasons why drugs are less desirable.

First, almost any compound may do some damage, for many agents produce their medical effects by slight poisoning of tissues. Untoward reactions of various types range from slight to severe. When the person is unusually sensitive, sudden, severe shock and in exceptional cases death, may occur.

Second, the person may become addicted to narcotics and similar remedies. Other persons, though not addicted, become too dependent on medication, using it like a crutch instead of relying on their own resources, as in learning to relax.

Third, tranquilizers and the like tend to slow people down in all they do, including their

Lesson 11 (Cont.-2)

daily work. Not only efficiency but judgment may be impaired. For this reason, the Civil Aeronautics Board has declared that pilots taking tranquilizers should be grounded.

Tranquilizers, sedatives and pain killers should never be taken regularly without benefit of medical advice and supervision.

ASSIGNMENT: YOU MUST RELAX, Chapter 17, Relaxing the Mind; Chapter 18, Common Nervous Disorders. OUTLINE Part 6, Muscular Factor in Mental Activity.

PRACTICE for eye muscles; those used in looking left, right, up, down, and straight forward.

5 min. Rest, gradually closing the eyes.

5 min. With eyes still closed, imagine looking as far as you can to the left, then to the right, left, ritht, left, right. Relax.

10 min. With eyes open and head up, again look left and right three times noting tensions, then relax all muscles used.

5 min. With eyes closed, imagine looking up toward the ceiling, then down toward the floor, up, down, up, down. Relax all muscles you felt were tense.

10 min. With eyes open and head up, actually look up and down three times, as when you imagined looking. Repeat, moving eyes just enough to feel tenseness.

5 min. With eyes closed, imagine looking straight forward; relax. Repeat, then relax completely.

Lesson 11 (Cont.-3)

15 min. Repeat previous set of instructions, then let all tensions go as far as you can.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 12

Time (approx.)

15 min. **COMMENTS**: You cannot think, imagine, remember, worry, be angry, or be sad, in fact be mentally or emotionally active in any way without using some of your muscles. If you just think of doing something with your arm or leg such as playing handball or kicking a football, the appropriate muscles will contract very slightly. If you just think of a word, the muscles of your tongue that would be used to speak that word contract very slightly. Such incipient movements can actually be recorded because even the slightest muscular activity creates a tiny amount of electrical energy that can be picked up by electrodes placed on the arm, leg, or tongue and amplified. Many experiments with high gain amplifiers have demonstrated this fact.

The slight tensions produced by these "thought effects" in muscles are enough to stimulate the delicate sense organs located in these muscles. This causes nerve impulses to travel from the muscles back into the cord and brain as a "feed-back" system to regulate and perpetuate further thought and further muscle tensions. Thus a basic mechanism so widely exploited by modern day electronic engineers has existed in the animal neuromuscular system for untold millions of years. It is in fact the controlling mechanism for all human activity involving muscles, including thought processes.

Against this background of fact it becomes understandable why the thinking process can be reduced to the state of "blanking" the mind when all muscles, particularly those of the tongue, and voice are relaxed. Because the eye muscles are used in all visual activity, they are in a special way related to the visual components of thought. Many people find that only when the eye muscles are also relaxed will their minds become blank. This explains the experience of a man who after losing an arm was unable to imagine using that arm without producing tensions in the other arm.

Facts such as these speak for the unity of body and mind and give powerful support to the claims that neuromuscular relaxation can serve to rest the mind, quiet emotional activity, and by eliminating unnecessary or distracting "feed back" from useless muscular activity, improve the function commonly called "mental concentration".

ASSIGNMENT: YOU MUST RELAX, Chapter 19, Quest for Sleep; Chapter 20, Solving the Mystery of Sleep; Chapter 21, How to Sleep Well. OUTLINE Part 7, Sight and Speech Muscles in Self Control.

PRACTICE for eye muscles.

5 min. Rest, gradually closing eyes.

10 min. Will students quietly stand facing each other in pairs, two arm lengths apart. Taking turns, while one watches, the other moves a pen or pencil, held vertically, from left to right to left, once per second, as teacher sets the time. Observe all tensions. Sit and relax the eye muscles.

10 min. Imagine the pen moving twice as fast. What is it that controls the speed of imagined motion? Relax, and continue to relax.

10 min. Imagine standing on the sidewalk and watching a woman walking quickly from your left to right on the opposite sidewalk. Next imagine a man strolling from right to left. Then imagine a child standing and looking in a shop window. Stop observing the child and relax. What happens to the tension in eye muscles when you stop looking.

5 min. Imagine you are watching a robin in a park, first on the ground about five feet away. Imagine he flies to a tree top, perches, and flies back to the ground. Stop and relax.

15 min. Imagine the child as before, then relax as far as possible.

5 min. Stop relaxing. Time for questions.

Lesson 13

Time (approx.) **COMMENTS:** Better sleeping habits are the
benefit most often mentioned by students who
15 min. learn to relax. Well before the last lesson, some may speak of falling asleep quickly at night, instead of tossing and turning with the mind active for hours. Many say they are getting enough sleep for the first time in years. Others notice that while not actually sleeping longer than before, they awaken in the morning feeling more thoroughly rested. Some may find that they dream less.

It has been discovered experimentally that when eye and speech muscles are very well relaxed for a short time, as little as thrity seconds, the subject is asleep. One may also fall asleep during steady monotonous tension, as in driving a car. However, tense sleep is generally fidgety, dream filled, and not as refreshing as relaxed sleep.

If you are wakeful at night, try deliberately to let all your muscles relax together. If this fails, look for large, obvious tensions in the arms, legs, and trunk, and let them go. If necessary, repeat this several times at intervals of five or ten minutes. Finally, try relaxing eye or speech muscles, perhaps starting with those that close the lids tightly. At the same time, you may let a large, easy group go limp, such as abdominal muscles. Letting the visual and vocal apparatus relax helps one to stop thinking. Since eye and speech muscles commonly direct most of your voluntary activity, the whole body may relax with them.

ASSIGNMENT: YOU MUST RELAX, Chapter 15, Instruction by the Doctor; Chapter 22, Indigestion and Colitis; Chapter 23, What Causes High Blood Pressure, OUTLINE Part 8, Relaxation is not Hypnosis.

PRACTICE for muscles that close jaws, open jaws, smile, and pout as if to whistle.

5 min.	Rest, gradually closing eyes.
5 min.	Close jaws firmly, hold, quickly relax. Close, hold, relax slowly, continue to relax.
10 min.	Close jaws only enough to feel tenseness, quickly relax. Repeat, continue to relax.
5 min.	Open jaws against resistance offered by left hand held under the jaw (tenseness may be hard to feel), hold, relax slowly; repeat, go on relaxing.
5 min.	Repeat last instruction, if possible with less tension, but enough to feel.

Lesson 13 (Cont.-3)

5 min. Smile broadly, quickly relax. Smile, slowly relax, and continue to relax.

5 min. Repeat with half as much tension, slowly relax; then smile with the least possible effort, relax, and continue relaxing.

5 min. Pucker lips as if to whistle, hold, quickly relax. Pucker, relax slowly, and continue relaxing.

10 min. Pucker just enough to feel tenseness, quickly relax. Imagine repeating last instruction, quickly relax all tension, continue relaxing.

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 14

Time (approx.) **COMMENTS**: A doubting person will occasion-
ally ask, "Is relaxation good or bad for health?
15 min. Even if not really harmful, is relaxation worth-
while for a busy person already pressed for time
by a multitude of activity?"

Let us first consider health. No one denies that too much rest is weakening. For example, a patient confined to bed quickly loses strength. Today, even after surgery, he is encouraged to sit up, stand, and walk as soon as possible, or to exercise in bed.

Excessive muscular tension on the other hand, is at least a contributing factor in many serious diseases. Chronically high muscle tension may result in high blood pressure, heart attacks, nervous breakdown, gastrointestinal disorders and other ailments, and may conplicate or worsen many other diseases.

Neuromuscular relaxation, therefore, is preventive medicine, probably as vital to public health as protection from contagious disease. In addition, relaxation helps you control your daily efforts to the best advantage. Over and over, students say that training courses help them to do faster, better work of all kinds, from athletics to cramming for exams, and with less fatigue than ever before.

Having learned to relax, a person must employ this new skill with judgement---just when and where needed, and in the proper degree.

ASSIGNMENT: YOU MUST RELAX, Chapter 24, How to Reduce High Blood Pressure; Chapter 25, How to Save Your Heart; OUTLINE Part 9, After the Last Class. Bring in questions about doubtful points. (This assignment completes reference material.) Bring two good test questions.

PRACTICE for muscles that move tongue forward and back; also all other muscles involved in actual and imagined talking.

5 min. Rest, gradually closing eyes.

5 min. Push tongue forward against teeth, quickly relax. Repeat, go on relaxing.

5 min. Pull tongue back, relax slowly. Repeat, continue to relax.

5 min. Count to ten aloud, noting tenseness in and near the mouth. Relax quickly then repeat and continue to relax. (Teacher leads count.)

Lesson 14 (Cont.-3)

10 min.	Count as before, noting any other tensions (throat, chest, abdomen); very slowly relax all muscles used. Repeat, and continue to relax.
10 min.	Whisper, counting to ten. (Teacher still leads.) Note tension, relax quickly, continue to relax.
10 min.	Imagine counting (with teacher), relax quickly, continue to relax.
5 min.	Imagine counting to five, relax quickly; repeat, and go to zero.
5 min.	Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Lesson 15

Time (approx.)

15 min. COMMENTS: In this short, intensive course, you have been taught the principles and habits of neuromuscular relaxation. Many people need only a few weeks of instruction and practice. By now you are probably letting tight muscles relax automatically, without directing attention to them very often during the day. Continued practice will help to perfect the habit.

During physical, intellectual, or emotional stress when you are most keyed up and eager to go on, it may be most helpful to let down even for just a few moments of complete relaxation when opportunity is afforded. This may take a bit of self control.

Some people who have trouble relaxing may find the following steps useful.

1. Observe yourself to see if certain situations, people, words, or ideas habitually make you tense. If so, jot these down.
2. While practicing relaxation let these thoughts, etc. run through your mind. If for example, the dentists chair or the boss's appearance makes you tense, then imagine sitting in the dentist's chair or

meeting the boss while you are relaxing. If you can learn to relax with that thought in your mind, you will also remain relaxed when next you are in the actual situation.

In time you can learn to "scan" your body for tensions beginning with the head, quickly checking all muscle groups down to the toes. With practice this "internal scanning" can result in relaxing the entire musculature in a few seconds at your desk, in an easy chair, or while reclining.

ASSIGNMENT: Review all lesson material. YOU MUST RELAX: key chapters are Preface, Chapters 8 to 14, 16, 17 and 21. Important definitions should be checked.

PRACTICE for visual and speech muscles.

5 min. Rest, gradually closing eyes.

10 min. With eyes closed, recall meeting a friend after a baseball game and saying to him, "What was the score?" Note as many speech tensions as possible. Relax quickly. Repeat, and continue to relax.

10 min. Repeat last instruction. In addition, if you imagine seeing your friend, note visual tensions. Relax both eye and voice muscles.

5 min. Imagine telling a teacher, "I'd like to be excused from class early, to catch a train home." Relax. Repeat sentence slowly, observe, relax.

10 min. Repeat last instruction, observing even more carefully; repeat, relax.

Lesson 15 (Cont.-3)

5 min. Imagine you are in a candy store, saying to the clerk, "I'd like this box of chocolates, please." Relax. Repeat slowly, observe, relax.

10 min. Repeat last instruction, slowly and carefully. Relax. (Teacher may suggest other situations involving more or less tension).

5 min. Stop relaxing. Time for questions.

STUDENT'S CLASS NOTES

Reading List

Haugen, G. B., H. H. Dixon, and H. A. Dickel, "A Therapy for Anxiety Tension Reactions", Macmillan, N.Y., 1960. This is an account of the experiences of three psychiatrists in teaching neuromuscular relaxation as a therapeutic measure in their practices. There are case reviews and discussions of principles.

Jacobson, Edmund, "Progressive Relaxation", University of Chicago Press, Chicago, Revised Edition 1938. This is a revision of Dr. Jacobson's first (1928) comprehensive discussion of his researches and method in the field.

_______________, "You Must Relax", McGraw-Hill, New York, 4th Edition 1957. This is a rather popular presentation of the subject and serves as textbook for the course.

_______________, "Direct Electrical Measurement of Mental Activities in Action Potentials" - Collected original researches of Dr. Jacobson, privately printed by the author. The collection may be secured from Dr. Edmund Jacobson, 55 E. Washington St., Chicago, Ill. It reports experiments that disclose electrical activity in various muscle groups, accompanying mental activity.

_______________, "An Outline of Scientific Relaxation", A supplement to Muscular Training, Arranged for the Classroom by Bernadine Lufkin. This is a 14 page mimeographed statement of major problems met by the student and teacher of relaxation. It contains many practical suggestions gleaned from the author's long experience. It is copyrighted and distributed by the author (address as above).

Schultz, Johannes H., and Wolfgang Luthe, "Autogenic Training - A Psychophysiologic Approach in Psychotherapy", Grune and Stratton, New York and London 1959. Description of a system of therapy in which relaxation is allegedly induced by various autosuggestion procedures. A bibliography of 604 titles is listed.

Wolpe, Joseph, "Psychotherapy by Reciprocal Inhibition", Stanford University Press, Stanford 1958. Dr. Wolpe illustrates in case studies how he has used the teaching of neuromuscular relaxation to relieve anxiety states. He emphasizes learning relaxation in the presence of tension generating thoughts.

GEORGE WILLIAMS COLLEGE

RELAXATION DIARY

Name:________________________

Date:________________________

Instructor:__________________

This Diary should be submitted to the instructor once a week at the beginning of the class session. Diary notes should show the time of day when relaxation was practiced and how long.

Monday, Date____________________

Tuesday, Date____________________

Wednesday, Date____________________

Thursday, Date____________________

Friday, Date____________________

Saturday, Date____________________

Sunday, Date____________________

Instructor's Comments

Appendix 2

OUTLINE OF TEACHERS COURSE IN THEORY, PRACTICE, AND TEACHING OF NEUROMUSCULAR RELAXATION

Leading to Certification as a Teacher

The course is divided into three parts which are taught more or less simultaneously.

Part I Theoretic bases of neuromuscular relaxation
Lectures and demonstrations include the following items:

1. Testing of individual students and explanation of the testing equipment. The student is tested at the beginning and end of the course.

2. Muscle receptors and the proprioceptors as initiators of neuromuscular tension impulses, histologic examination of receptors in the laboratory.

3. The stretch or myotatic reflex and related cord functions.

4. The regulation of muscle spindle activity and tonus reflexes by the gamma fiber system.

5. Contributions of the reticular formation and other brain stem structures to facilitation and inhibition of tension reflex functions. The waking or alerting function of the reticular formation in relation to the proprioceptive inflow.

6. Hypothalamic and limbic centers and circuits.

7. Cortical localization with special reference to pyramidal and extrapyramidal motor activity.

8. Hypothalamic - autonomic pathways.

9. Hypothalamic - hypophyseal interrelations.

10. Role of endocrines in stress responses.

11. Theories of learning applied to the learning of neuromuscular relaxation.

12. Comparison of various methods of inducing relaxation i.e. hypnosis, autosuggestion, "meditation", mental imagery, and "learning-unlearning".

13. Principles governing the teaching of relaxation as a learning experience.

14. Instrumental and less objective ways of assaying student progress in learning to relax.

15. Adaptation of teaching procedures to various ages and situations. (The emphasis is varied according to the occupational interests of the students).

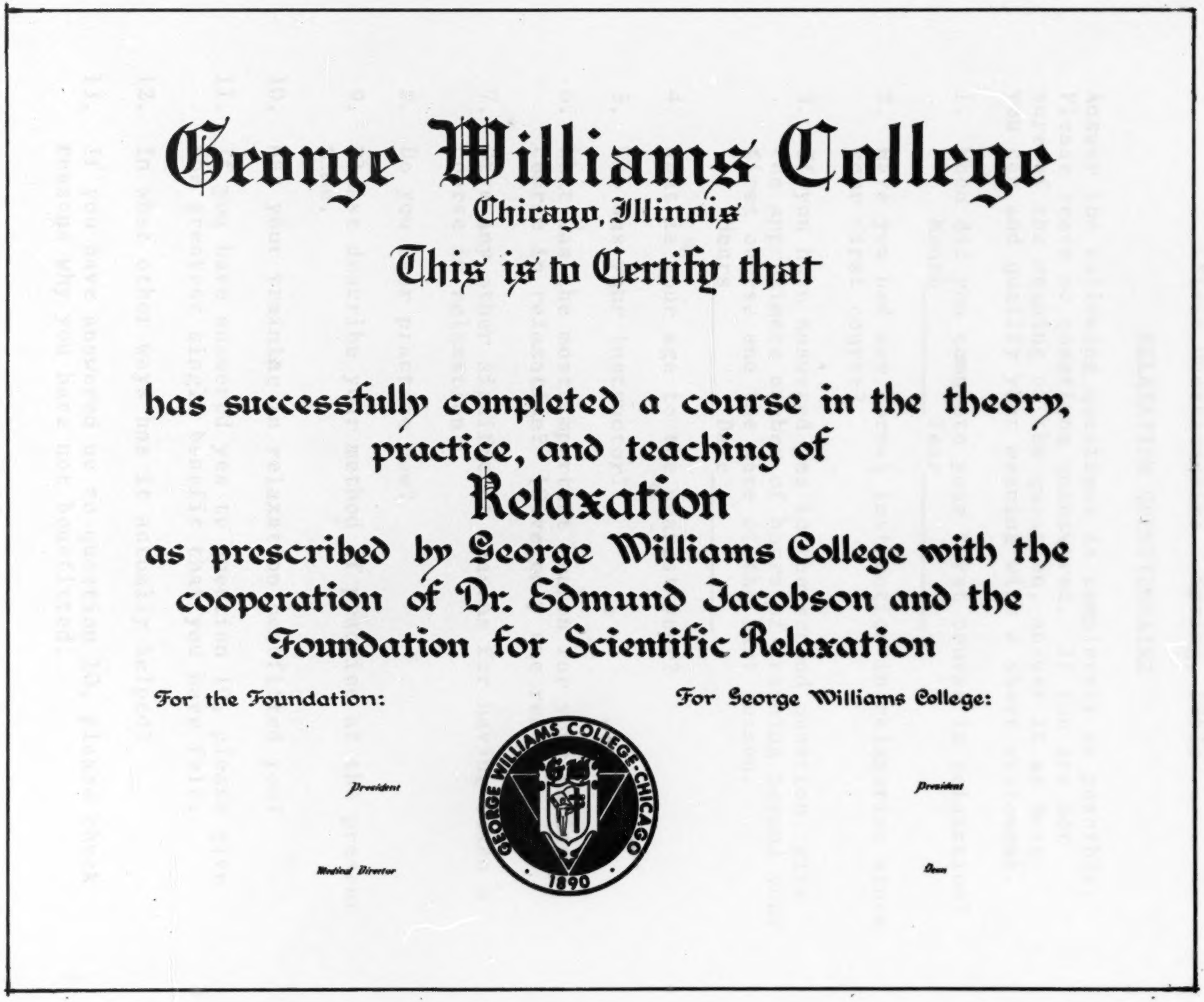
Part II Practice in neuromuscular relaxation
The student is systematically instructed in accordance with the standard 15 lesson outline.

Part III Practice teaching
Each student is observed while he is actually teaching an assigned portion of the lesson outline to a group of students. His performance is evaluated and suggestions for improvement are made where necessary.

The course concludes with a final examination in which the student's understanding of basic principles, of the advantages, and of the limitations of neuromuscular relaxation are tested.

In judging the student's accomplishments in the course his performance in regular class sessions, in practice teaching, and in the examination are taken into consideration.

Appendix 3



George Williams College

Chicago, Illinois

This is to Certify that

has successfully completed a course in the theory, practice, and teaching of

Relaxation

as prescribed by George Williams College with the cooperation of Dr. Edmund Jacobson and the Foundation for Scientific Relaxation

For the Foundation:

President

Medical Director

For George Williams College:

President

Dean

Appendix 4

(First Questionnaire - Spring, 1963)

RELAXATION QUESTIONNAIRE

Answer the following questions as completely as possible. Please leave no questions unanswered. If you are not sure of the meaning of the question, answer it as best you can and qualify your meaning with a short statement.

1. When did you complete your first course in relaxation?
   Month__________ Year____________

2. Have you had any formal instruction in relaxation since your first course?

3. If you have answered yes to the second question, give the approximate number of hours of training beyond your first course and the date of the last lesson.
   Hours_________ Date___________

4. What is your age to the nearest year?

5. Who was your instructor?

6. What was the most important reason for your taking a course in relaxation? (Give only one reason)

7. Give any other significant reasons for having taken a course in relaxation.

8. Do you ever practice now?

9. Please describe your method of practice at the present time.

10. Has your training in relaxation benefitted you?

11. If you have answered yes to question 10, please give the greatest single benefit that you have felt.

12. In what other ways has it actually helped?

13. If you have answered no to question 10, please check reasons why you have not benefitted.

_____a. never felt tense anyway
_____b. did not practice enough
_____c. forgot about relaxation after the course
_____d. do not believe it ever helped anyone
_____e. other (specify)

14. Did you ever feel any benefit during athletic performance?

15. If you answered yes to question 14, please describe briefly.

16. Did you find one particular location on the body where your "tension spot" was located?

17. If yes to 16, where was your "tension spot"?

18. If yes to 16, is this tension spot still apparent to you?

19. Do you feel a need for more instruction in relaxation?

20. Approximately what percent of your friends do you feel could benefit from formal instruction in relaxation?

(Second Questionnaire - January, 1964)

For Students of Relaxation

1 - Your Name____

Address____

2 - How long was the course you took in relaxation? ____Weeks

3 - In the following list check the items that you feel you have accomplished because of your training in relaxation.

_____I can fall asleep more quickly.
It takes me about_____minutes to fall asleep.

_____I can "blank" my mind by relaxing.
Such "blank" periods last approximately____minutes.

_____I can stop "inner voices" or "singing to myself", at will.

_____Relaxation has improved my power of mental concentration.

_____I can stop a headache.

_____I can reduce the sensation of pain.

_____My elimination is improved.

_____My digestion is improved.

_____My disposition has improved.

_____I have observed no changes due to training in relaxation.

4 - Add here any other interesting comments or changes you have noticed.

5 - If you have taught others to relax, please answer the following:

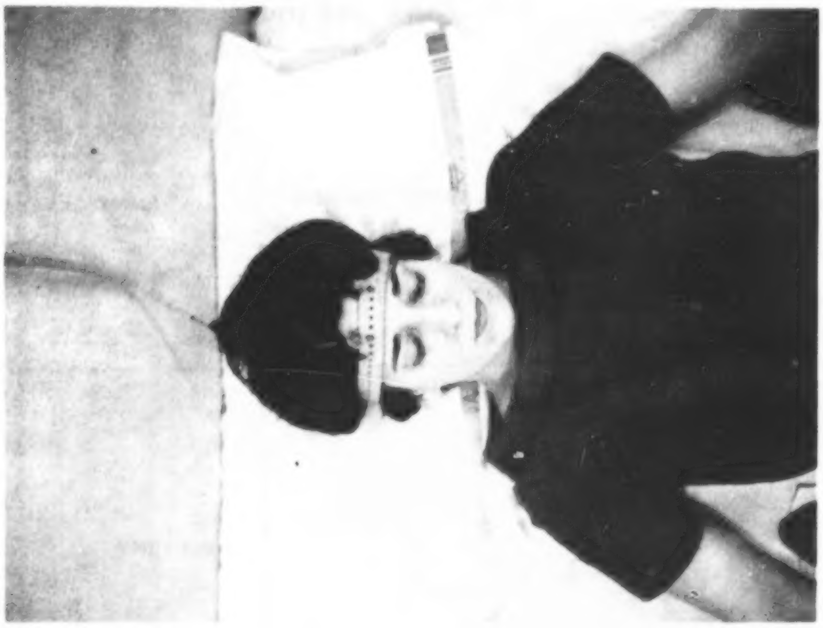
a - I have taught relaxation to_____of groups.
(number)

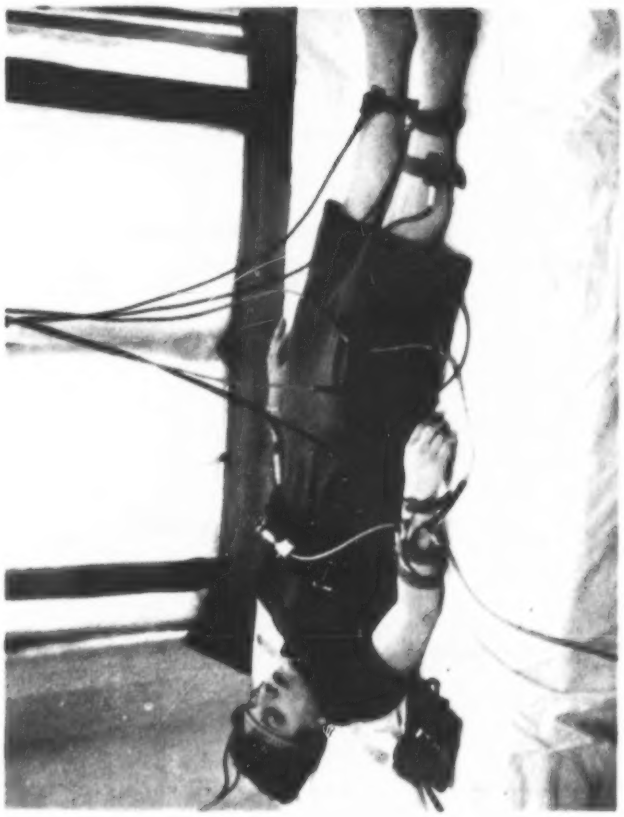
b.- I have taught approximately_____persons to relax.

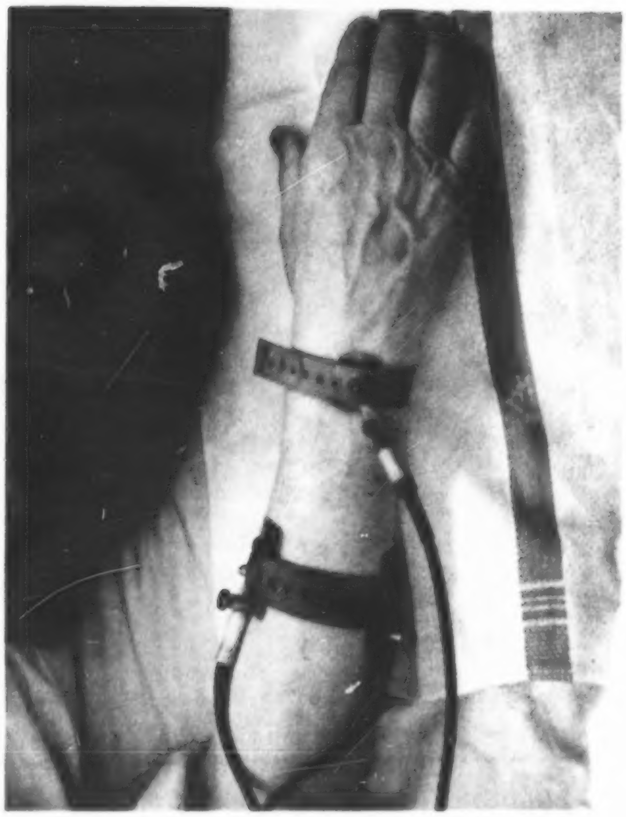
Please return this data sheet immediately to Arthur H.Steinhaus
George Williams
College
5315 S. Drexel Ave.
Chicago, Illinois
60615

Appendix 5

PLACEMENT OF ELECTRODES

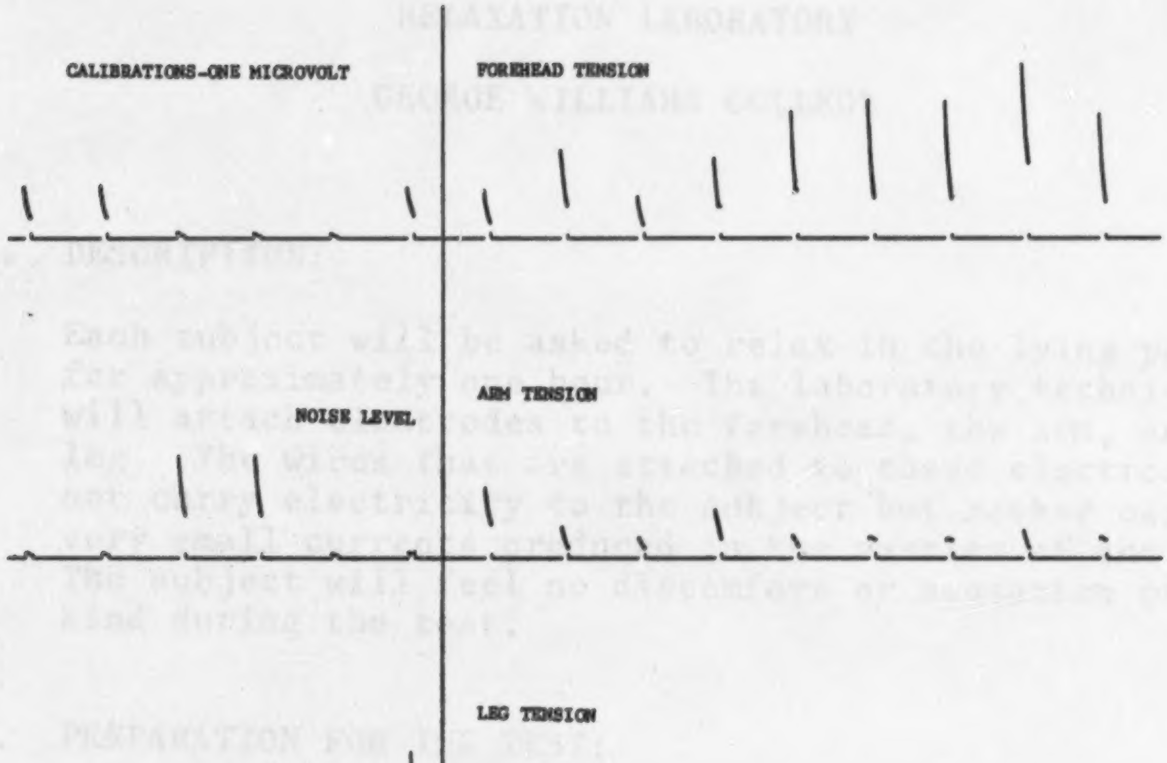






Appendix 5

SAMPLE TRACING



Respiratory and heart rate (lower portion) recorded separately after muscle tensions (upper portion).

Appendix 6

(Instructions To Subjects)

INFORMATION CONCERNING NEUROMUSCULAR RELAXATION TEST

RELAXATION LABORATORY

GEORGE WILLIAMS COLLEGE

A. DESCRIPTION:

Each subject will be asked to relax in the lying position for approximately one hour. The laboratory technician will attach electrodes to the forehead, the arm, and the leg. The wires that are attached to these electrodes do not carry electricity to the subject but rather carry very small currents produced in the muscles of the subject. The subject will feel no discomfort or sensation of any kind during the test.

B. PREPARATION FOR THE TEST:

1. Make an appointment by calling BU-8-8910.
2. On the day of the test, report promptly to the relaxation laboratory. (George Williams College, 5315 S. Drexel Ave., Chicago) Come in an unhurried manner.
3. Please refrain from the use of alcohol for 24 hours prior to the test. Tea, coffee, coke, and tobacco should not be taken for 6 hours prior to the test. Do not take aspirin, sedatives, or tranquilizers on the day of the test.
4. Unless they are an absolute necessity, discontinue all other medications on the day of the test. Consult your physician if it seems advisable.
5. If it is necessary to break your appointment, please call and let us know.

Thank You for Your Cooperation